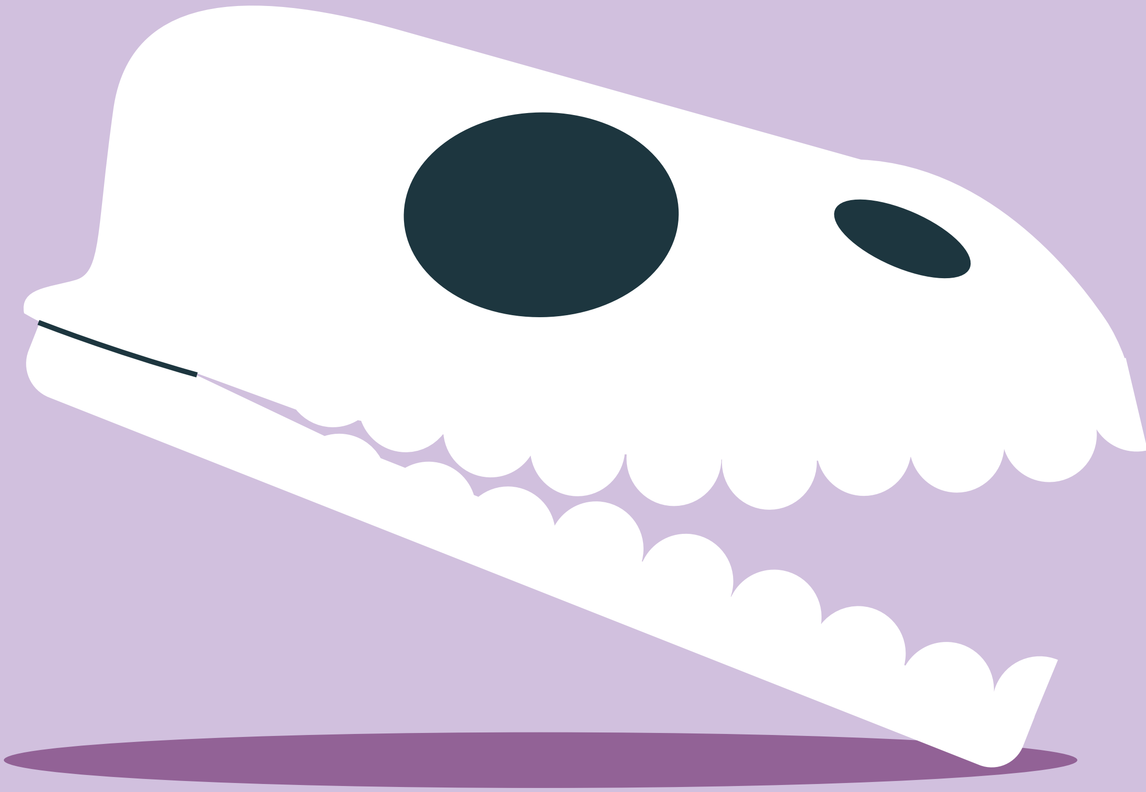
Amplify.
TEXAS
ELEMENTARY LITERACY PROGRAM

ENGLISH



Grade 5

Unit 8 | Teacher Guide

Chemical Matter: Detectives, Dinosaurs, and Discovery

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Detectives, Dinosaurs, and Discovery

Teacher Guide

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Introduction

CHEMICAL MATTER: DETECTIVES, DINOSAURS, AND DISCOVERY

This introduction includes the necessary background information to teach the Chemical Matter unit. This unit contains 15 daily lessons, plus four Pausing Point days that may be used for differentiated instruction. Lessons and activities address various aspects of a comprehensive language arts curriculum aligned to the standards: reading, writing, spelling, grammar, and morphology. Each entire lesson will require a total of 90 minutes. Lesson 15 is devoted to a unit assessment.

As noted, four days are intended to be used as Pausing Point days. You may choose to use all four days at the end of the unit, or you may use one day immediately after Lesson 6 and three days at the end of the unit. If you use one Pausing Point day after Lesson 6, review students' integration of material in Lessons 3 and 4 and writing task in Lesson 5, or you may use the day to focus on writing, spelling, grammar, or morphology skills covered in Lessons 1–6. It is recommended that you spend no more than 19 days total on this unit.

WHY THE CHEMICAL MATTER UNIT IS IMPORTANT

This unit is important for two reasons.

The Big Idea of this unit is that matter can be transformed by physical and chemical changes, which result in the extraordinary diversity of our physical world. This unit introduces students to the concept of matter, physical and chemical changes, and elements and compounds. It is not presented as a standard informational text but written as a detective story. Chemical content is introduced gradually and through the context of the protagonist's experiences, giving students constant examples of the practical interest of these ideas.

The structure of the Reader is also important. This is a unit that combines literary and informational characteristics into a single text. It also asks students to look beyond the reader to additional sources to understand and explain the concepts introduced. This unit therefore asks students to *integrate* the skills they have learned in the rest of Grade 5: how to read and analyze informational and literary texts, how to use information to explain concepts and ideas, and how to write for different audiences and purposes.

The *Chemical Matter* unit provides opportunities for students to build content knowledge and draw connections to the social studies subject area, but it does not explicitly teach the Texas Essential Knowledge and Skills standards for Social Studies. At times throughout the unit, you may wish to build on class discussions to support students in making cross-curricular connections to the strands of Social Studies skills from the social studies discipline, and Matter and Energy and Scientific Investigation and Reasoning from the science discipline.

Prior Knowledge

Most of the content in this unit is new to students, whether they have received instruction in the program in K–4 or not. Much of the material presented here is built upon in the Program Sequence in Grades 6 onwards.

Students studying with this program, however, will have received introductory knowledge on the following:

Plants (Kindergarten)

- Identify photosynthesis as the process where plants turn water, nutrients, air and light into food.

Seasons and Weather (Grade 2)

- Describe the main stages of the Water Cycle.
- Identify that water exists in different states including frozen water (ice) and vapor.

Geology (Grade 4)

- Describe how sedimentary rock is formed, including from once-living things.

READER

The Reader for this unit, *The Badlands Sleuth: The Case of the Missing Fossils,* includes complex text and prepares students in Grade 5 for the increased vocabulary and syntax demands texts will present in later grades. *The Badlands Sleuth* tells the story of a fossil dig, in which a number of fossils go missing and the protagonist, Amy, must use the chemistry she is learning to solve the mystery. Through this, students are systematically exposed to chemical content.

The Reader also includes two selections that may be used for enrichment. Although the Teacher Guide does not include lessons for these enrichment selections, the Activity Book includes activity pages students may complete independently. Please use these selections at your discretion, considering students' needs and the time available in your school day.

WRITING

As with other literary units in Grade 5, writing is integrated with the reading process in these lessons. Students use the insights they have gained from close reading and apply them to a variety of writing tasks. Because the unit is both literary and informational, writing tasks vary accordingly. The key skills that students build on in this unit are:

- appropriate organization of content for a range of purposes
- combining informational and literary details
- applying recently learned insights to convey information and understanding to others
- integrating information from multiple sources to explain concepts and ideas
- revising writing in response to peer feedback

Crucially, some of the activities are so integrated that they have been labeled as both reading and writing segments in the lesson.

The culminating writing task for this unit asks students to write Amy's next case: another detective story which uses scientific content to solve a mystery. This is a deliberately open ended task, asking students to apply the skills they have learned through Grade 5 (and before). It is also intended to be an enjoyable final task of the year.

During all classroom writing tasks, please encourage students to generate logical, defensible spellings based on code knowledge, rather than guessing. You will also find writing rubrics for the writing tasks in Lesson 2, 5, and 10 in the "Teacher Resources" in this Teacher Guide.

Earlier grades in the program include five steps in the writing process: planning, drafting, revising, editing, and publishing. Beginning in Grade 4, the writing process expands to include the following components: planning, drafting, sharing, evaluating, revising, and editing (and the optional component of publishing). In Grades 4 and 5, the writing process is no longer conceptualized as a series of scaffolded, linear steps (an important change from the Grade 3 writing process). Rather, students move among components of the writing process in a flexible manner similar to the process mature and experienced writers follow naturally (see Graham, Bollinger, Booth Olson, D'Aoust, MacArthur, McCutchen, and Olinghouse [2012] for additional research-based recommendations about writing in the elementary grades).

Writing lessons include multiple opportunities for peer collaboration and teacher scaffolding. Additionally, when students write, you should circulate around the room and check in with students to provide brief, targeted feedback.

In addition to specific writing lessons, the program provides numerous writing opportunities. For example, students regularly engage in writing short answers in response to text-based questions. In these writing opportunities, students will focus on the use of evidence from the text and on individual sentence construction.

FLUENCY SUPPLEMENT

A separate component, the Fluency Supplement, is available on the program's digital components site. This component was created to accompany materials for Grades 4 and 5. It consists of selections from a variety of genres, including poetry, folklore, fables, and other selections. These selections provide additional opportunities for students to practice reading with fluency and expression (prosody). There are sufficient selections so you may, if desired, use one selection per week. For more information on implementation, please consult the supplement.

TEACHER RESOURCES

At the back of this Teacher Guide, you will find a section titled "Teacher Resources." In this section, information is included about the following:

- Glossary
- Pages from Geology Reader
- Changes in State Diagrams
- Four Sample Character Maps
- Periodic Table
- Sample Police Reports
- Articles on Investigations
- Fossil Image Poster
- Rubric: Presentation Lesson 5
- Rubric: Presentation Lesson 9
- Rubric: Presentation Lesson 11
- Plot Diagram
- Narrative Rubric
- Activity Book Answer Key

DIGITAL COMPONENTS

In the Advance Preparation section of each lesson, you will be instructed to create various posters, charts, or graphic organizers for use during the lesson. Many of these items, along with other images such as maps or diagrams, are also available on the program's digital components site.

LESSON

1

Entering the Badlands

PRIMARY FOCUS OF LESSON

Reading

Students will quote accurately from the text to explain its setting and scientific content. **TEKS 5.3.B; TEKS 5.7.C; TEKS 5.8.D**

Writing

Students will write detailed descriptions of the physical properties of objects. **TEKS 5.12.B**

Speaking and Listening

Students will discuss the presentation of content in three different texts. **TEKS 5.6.H; TEKS 5.9.D.ii; TEKS 5.9.D.iii; TEKS 5.13.D**

FORMATIVE ASSESSMENT

Activity Pages 1.1 and 1.2	**Welcome to Fossil Camp; Vocabulary** Use textual evidence to identify literary and informational details, using multiple-choice answers, and a graphic organizer. **TEKS 5.3.B; TEKS 5.7.C**
Activity Page 1.3	**Think of an object that qualifies as matter** Provide a clear written description of an object's physical properties. **TEKS 5.12.B**

TEKS 5.3.B Use context within and beyond a sentence to determine the relevant meaning of unfamiliar words or multiple-meaning words; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.D** Analyze the influence of the setting, including historical and cultural settings, on the plot; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.9.D** Recognize characteristics and structures of informational text, including (ii) features such as insets, timelines, and sidebars to support understanding; (iii) organizational patterns such as logical order and order of importance; **TEKS 5.13.D** The student is expected to understand the credibility of primary and secondary sources.

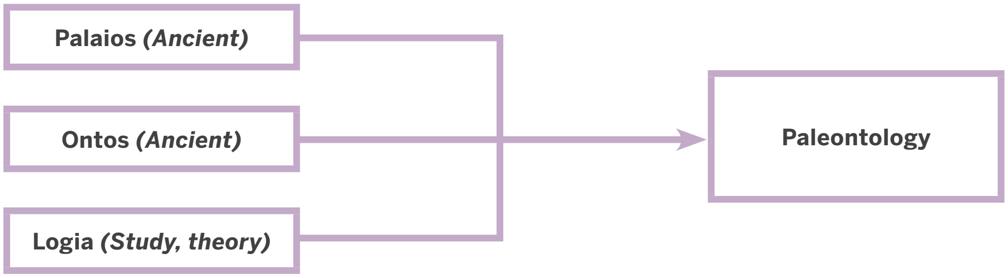
LESSON AT A GLANCE

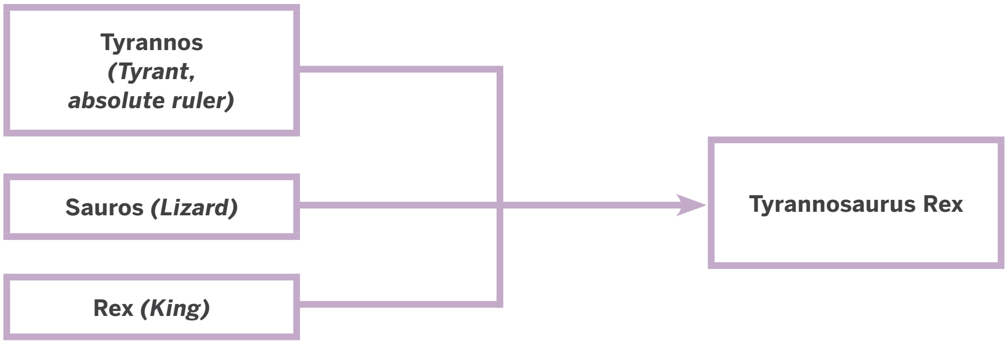
	Grouping	Time	Materials
Reading (45 min.)			
Read-Aloud: Chapter 1, Part 1	Whole Group/ Independent	20 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 1.1, 1.2 ❏ Definition of Setting ❏ Poster on Scientific Definition (Digital Components) ❏ Geology: The Changing Earth (Digital Components)
Word Work: Scientific Terms	Whole Group	5 min.	
Read-Aloud: Chapter 1, Part 2	Whole Group	20 min.	
Writing (20 min.)			
Describe Physical Properties	Independent/ Partner	20 min.	❏ Activity Page 1.3 ❏ Optional: Range of Objects for Descriptions
Speaking and Listening (25 min.)			
Analyze Geology Text	Partner	10 min.	❏ Activity Page 1.4
Analyze Chemical Matter Text	Partner/ Whole Group	15 min.	

ADVANCE PREPARATION

Reading

- Write a definition of *setting* on the board/chart paper: "The time and place of the story." (where, when, and under what circumstances)
- Prepare the following poster on scientific definition. Alternatively, you may access a digital version of this in the digital components for this unit.





Writing

- You may wish to provide some objects for students to describe (for example, ask them to pick objects out of a bag without showing their partners), instead of asking them to describe any object from their memory.
- This activity may be extended further into science lessons; for example, giving the opportunity to measure the mass of objects.

Speaking and Listening

- Review the Geology content, which was taught in Grade 4 and is found excerpted in student activity books. You may access a digital version of this in the digital components for this unit and in the Teacher Resources in this Teacher Guide.
- Ensure there is space on the board/chart paper to list literary and informational characteristics of texts. Please keep this on the board for the following lesson.

- This lesson contains Think-Pair-Share activities.
- You will need to record the results of a class vote.

Universal Access

- For the reading segment, students needing support may find it helpful to spend a moment visualizing the setting before beginning Activity Page 1.1.
- You may also wish to reproduce the first paragraph of the Reader and underline descriptive words for the setting.
- For the writing segment, students needing substantial support should use the structure below for their descriptions.
    - The object I am describing is in a liquid/gas/solid state. (or form)
    - It looks like ______ and is the color ______.
    - If you touch it you can feel ______.
    - It smells like ______.
    - Other physical properties of the object include ______.
- For students needing moderate support in the writing segment, ask them to use the following prompts for their descriptions in the writing segment of this piece:
    - What state is the object in?
    - What are its physical properties? For example, what is its color? Does it smell? What texture does it have? Does it have a taste?
    - Are there any other facts about the object that are useful to describe?
- For the Speaking and Listening segment, use some of the following sentence starters to help students Think-Pair-Share:
    - I think this is an informational/literary characteristic of the text because ______.
    - I agree that this characteristic suggests the text is informational, and I also think this characteristic ______.
    - I agree that this characteristic suggests the text is informational, however, if you look at this characteristic ______.
    - I am not sure this is correct, because ______.
    - That is a good point, however, if you look at this characteristic of the text ______.

ACADEMIC VOCABULARY

characteristic, n. a feature of something/someone

Start Lesson

Lesson 1: Entering the Badlands

Reading

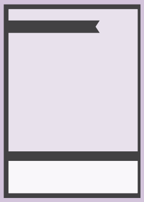
45M

Primary Focus: Students will quote accurately from the text to explain its setting and scientific content. **TEKS 5.3.B; TEKS 5.7.C; TEKS 5.8.D**

READ-ALOUD: CHAPTER 1, PART 1 (20 MIN.)

Introduce the Chapter: "Welcome to Fossil Camp"

The Badlands Sleuth



- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 1. As with previous units, preview the Reader by reading the title and giving students a chance to flip through and comment.
- Tell students they will read the first half of Chapter 1, "Welcome to Fossil Camp!"
- Have students turn to the table of contents, locate the chapter, and then turn to the first page of the chapter.
- Preview the core vocabulary words before reading the chapter.
- Begin by telling students the first vocabulary word they will encounter in this chapter is *mutter*.
- Have them find the word on page 1 of the Reader. Explain that each vocabulary word is bolded the first time it appears in the chapter.
- If required, have students refer to the glossary at the back of the Reader, locate *mutter*, and then have a student read the definition.
- If required, explain the following:
    - the part of speech
    - alternate forms of the word
- If required, have students reference Activity Page 1.2 while you read each word and its meaning.

TEKS 5.3.B Use context within and beyond a sentence to determine the relevant meaning of unfamiliar words or multiple-meaning words; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.D** Analyze the influence of the setting, including historical and cultural settings, on the plot.

Vocabulary

mutter, v. to say something in a low or hard-to-hear voice, often with annoyance

shimmer, v. to shine with a light that seems to move a little

barren, adj. bleak and lifeless

sandwich, v. to be squashed between two things

expert, n. someone who has deep knowledge and skill in an area, usually from long experience and study

lurch, v. to make a sudden, unsteady movement

paleontology, n. the science of fossils

chemistry, n. the science of matter

matter, n. any substance that occupies space and has mass

mass, n. the amount of matter in a substance or object

Vocabulary Chart for Chapter 1, "Welcome to Fossil Camp"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	paleontology chemistry matter mass	mutter shimmer barren expert lurch
Multiple-Meaning Core Vocabulary Words		sandwich
Sayings and Phrases		

Read "Welcome to Fossil Camp," Part 1

- Read the chapter aloud from the beginning to the second paragraph on page 4 ("This is going to be so much fun!"), as students follow along in their Readers. As you read, stop to read and discuss the corresponding guided reading supports.

Chapter 1

Welcome to Fossil Camp!

THE BIG QUESTION
What is the "stuff" that makes up the universe?

"It's got to be over a hundred degrees out there," Amy **muttered**, staring through the windshield of the pickup. The badlands of eastern Montana **shimmered** in the heat under a pale, cloudless sky. **Barren** ridges of weathered rock towered above dry gullies and patches of stiff prairie grass. Amy aimed the air conditioner vent so it blew directly on her face. "I really don't like being hot."

"I'm afraid it's even hotter out at the fossil site," said Tess, swerving to avoid a pothole in the narrow dirt track. "Lately it's been over ninety degrees in the shade."

'*Great!*' thought Amy. She fanned herself with a paperback book. It was her favorite kind of book: a mystery featuring a clever detective. She had read most of it on the flight from Chicago and then finished it while she and Matt waited for Tess to pick them up at the small airport in Billings, Montana.

Amy glanced back at her twin brother. He was **sandwiched** between their two backpacks in the back seat, with a big grin on his freckled face. Last month, when Matt had learned about Fossil Camp, he'd burst into her room, waving the camp brochure. "We can actually dig for dinosaur fossils," he'd whooped. Amy had planned to spend her summer vacation at home, reading mysteries out on the breezy screened porch and drinking tall glasses of icy lemonade. But Matt had talked their parents into Fossil Camp—and Amy into coming with him. Now, sweltering in the heat, she was having second thoughts.

"What's Dr. Forester like?" Amy asked. She'd read in the brochure that Dr. Pam Forester was the paleontologist in charge of Fossil Camp.

1

- Read the chapter title aloud. Point to the definition of setting on the board, and remind students of previous investigations of setting (such as in the Contemporary Fiction unit in Grade 4). You may wish to ask students to volunteer the settings of different texts they have read this year, in class or out of class.
- As you read, ask students to pay particular attention to details in the text that describe the setting.

Literal. What have we been told about Amy's environment?

» The class should be able to list the following details:

1. It's hot. (100 degrees)
2. She's in Eastern Montana.
3. There are "barren ridges of rock towering over gullies and patches of stiff prairie grass." (You may wish to expand on this to ensure students understand what is being described.)
4. There are potholes in the road.

Literal. Where would Amy like to be instead?

» sitting on their porch drinking lemonade

Support. Matt, Amy's brother, is sandwiched between two backpacks. *Sandwich* in this context means "squashed between." Why do you think the word *sandwiched* is used for this?

» Students should identify that a sandwich has a filling squashed between two pieces of bread, just as Matt is squashed between two backpacks.

Inferential. What in the text tells you she would rather be there?

» "She was having second thoughts."

Evaluative. From the description of the landscape, which of these do you think is the most likely definition of *desolate:* (1) empty and lonely, (2) dangerous, or (3) crowded and uncomfortable?

» empty and lonely

Evaluative. What in the description gave you your answer?

» Students should point to the word *barren*.

Literal. Who are the people already at the camp when Amy arrives?

» Dr. Forester, Felix, Julian, Daria, and Kristal

Evaluative. Amy has now arrived at camp. What does the text tell us about how the camp looks?

» There's a cluster of tents under a high, barren ridge. There's a big canvas tent with an awning: the laboratory tent.

Check for Understanding

Point to the definition of *setting* on the board/chart paper. Ask students to identify the setting of the *The Badlands Sleuth.* Students may also identify the campsite.

Support

A cluster is a group of similar things close together. In this case, tents are close together.

“She’s amazing,” Tess replied, “and a world expert on Cretaceous dinosaurs.”

“Like *Tyrannosaurus*?” Matt asked.

“Like *Tyrannosaurus*,” Tess said, smiling at him in the rearview mirror.

“I hope we make an important **discovery**,” Matt said, digging his water bottle out of his pack.

“Anything’s possible,” Tess said. “These dry badlands are among the best places in North America to look for fossils, especially dinosaur bones.” She swerved again but failed to avoid a deep rut, and the pickup **lurched** hard to one side. “Sorry about the bumps,” she said, “but the road washes out a little bit more every time it rains.”

“Who are the other campers?” Amy asked.

“There are two other girls and two other boys,” Tess replied. “Daria and Julian are your age. Felix and Kristal just finished sixth grade, so they’re a year ahead of you in school.”

Amy hoped the other kids would be nice, because together with Dr. Forester and Tess, they were all going to be camped out in this desolate landscape for ten days. She glanced back at her brother again. Matt made new friends easily and he also didn’t mind heat. Or dirt. Or bugs. Or... Amy sat up suddenly as a new thought occurred to her. “Are there snakes out here?”

Tess nodded but kept her eyes on the track. “Plenty. But we rarely see them during the day because it’s so hot and they stay curled up in holes or under rock ledges.”

‘*Double great!*’ Amy thought, swallowing hard. Snakes made her sweat as much as hot weather. And what did Tess mean about not seeing snakes “during the day”? Did they come out at night? She was about to ask when they crested a low rise and Tess suddenly pointed.

“There’s our camp!”

2

A cluster of tents stood in the shadow of a high, barren ridge. A slender woman with a deep tan waved as they pulled in. When they stopped, she strode over to the pickup, followed by four kids.

"Welcome to Fossil Camp, Amy and Matt! I'm Dr. Forester, and these are your fellow campers." She quickly made the introductions. Felix was tall and very thin, with bony knees and elbows. Julian was about Matt's height, with close-cropped hair and a friendly grin. Daria was average height with short, dark hair and watchful eyes that seemed to take in everything at a glance. Kristal was taller than Daria. Her blonde hair was swept to one side in a ponytail, and she wore big dark glasses.

"Why don't you all help Amy and Matt get settled?" Dr. Forester suggested. "Then we'll have orientation in our field laboratory. That's the big canvas tent with the awning out front."

A wave of hot, dry air hit Amy as she stepped into the tent she was going to share with Kristal and Daria. "It's unbearable in here," she choked. "How are we supposed to sleep?"

"Dr. Forester says it gets a lot cooler at night," Daria said.

There were three cots inside, each with a sleeping bag and pillow. Kristal took off her sunglasses and used them to point at the cots, one by one. "I'm here and Daria's there, which leaves you in the bed by the door. Sorry."

Amy thought sleeping close to the tent flap might be the coolest spot at night, so she didn't mind not having a choice. She dropped her backpack onto her cot.

"Did you bring your phone?" Daria asked.

Amy nodded. "But I haven't gotten a signal since we left Billings."

Daria sighed and looked disappointed. "I thought maybe it was just my phone. I've never been anywhere I couldn't make a call. It's like being in the middle of nowhere."

3

Identifying the Setting

Activity Page 1.1

- Direct students to Activity Page 1.1 and review the instructions.

WORD WORK: SCIENTIFIC TERMS (5 MIN.)

- Ask students to return to page 2 of the Reader and read the sentence aloud.

  "She's amazing," Tess replied, "and a world expert on Cretaceous dinosaurs."

  "Like *Tyrannosaurus*?" Matt asked.

- Point to the poster you prepared earlier with the words *Tyrannosaurus rex* and *paleontology* and their origins.

  Literal. What country do scientists come from?

  » Students should be able to identify that scientists can come from any country.

- Tell students that scientists from many different countries, speaking many different languages, make discoveries. They often use two common, ancient languages to name their discoveries: Ancient Greek and Latin.
  - You may wish to remind students of their study of the civilizations that spoke these languages.
- Using *paleontology* as the example, explain how three Greek words, (1) *palaios* meaning *ancient* and shortened to *paleo*, (2) *onto* meaning *being*, and (3) *logia* meaning *study*, have been combined to make the word *paleontology*. Paleontology is, therefore, "the study of ancient beings or things."
- Tell students that although the words were complicated, because educated people often studied Greek and Latin, it meant that whatever country they came from, they could understand different scientific terms. It also avoided arguments about which modern language should be used!

Check for Understanding

Ask students to use the same method with the poster to explain the meaning of *Tyrannosaurus rex*.

» tyrant lizard king

ENGLISH LANGUAGE LEARNERS

Reading

Reading

Beginning

With 1:1 support, read aloud each sentence in the first paragraph. Ask students to identify descriptions of setting.

Intermediate

With finger sweeping, ask students to read each sentence in the first paragraph. Then ask them to place a cross if any picture does not apply to the description.

Advanced/Advanced High

Ask students to reread the first paragraph of the Reader, closing their eyes to visualize the setting before beginning Activity Page 1.1.

ELPS 4.B; ELPS 4.F

"We *are* in the middle of nowhere," Kristal said. She reached under her pillow, grabbed what looked like a large sketchbook, and stuffed it under her arm. "Come on, I don't want to miss anything."

"Cool camp, huh?" Matt whispered to Amy as they joined the others in the lab. "This is going to be so much fun!"

Hoping her brother was right, Amy tried to put the heat and the possibility of snakes out of her mind as everyone gathered around Dr. Forester. She was standing next to a long table on which there were boxes, some instruments that Amy recognized from science class, and six, small, cloth bags.

"Over the next ten days you're going to get firsthand experience excavating fossils," Dr. Forester began. "You'll also learn about other things that paleontologists do."

Felix raised a lanky hand. "Um, when do we eat?"

"Breakfast is at six o'clock and we'll leave for the fossil dig site at seven o'clock, along with a packed lunch and a cooler full of cold drinks. We'll return to camp around five, have dinner at six, and then you'll have some time to relax around the campfire before bed."

Felix raised his hand again. "And what about snacks?"

Dr. Forester suppressed a smile. "Don't worry, Felix, there will be plenty of food." Then she **gestured** toward Tess. "And now Tess has something to show you I think you'll find pretty interesting. She's is one of my students, by the way, and is getting her degree in **paleontology**, with a minor in **chemistry**."

"Chemistry?" Julian raised an eyebrow. "What's chemistry got to do with fossils?"

"Actually, quite a lot," Tess replied. "Chemistry is the reason we have fossils out there to hunt for and collect." She reached into the pocket of her jeans and drew out something dark and curved that she held up for them all to see. "Fossils like this."

4

READ ALOUD: CHAPTER 1, PART 2 (20 MIN.)

Read "Welcome to Fossil Camp," Part 2

- Read the chapter aloud, as students follow along in their Readers. As you read, stop to read and discuss the corresponding guided reading supports.

Inferential. What do Felix's questions suggest about his interests?

» that he likes food a lot

"Wow, a raptor claw!" Matt gasped.

"This claw belongs to *Velociraptor,* the type of dinosaur that certain movies made so famous," Tess explained. "The dinosaur whose fossil bones you will be excavating was closely related to Velociraptor, so there's a chance we might unearth a claw similar to this one." Tess handed the fossil claw to Daria and asked her to pass it around.

When Amy took the claw from Daria, she was surprised at how heavy it was. "What is a fossil, exactly?"

"You'll learn a lot about fossils and how they form while you're here at camp," Tess replied. "But for now, think of a fossil as **matter** that's undergone a change."

"Matter?" Julian asked, frowning.

"Matter is everything in and around you," Tess explained, "all the 'stuff' on the earth, in our solar system, our galaxy, and the rest of the universe."

"You mean the solid stuff, right?" Julian's frown had deepened.

"Not just the solids. Matter exists in different forms, or states. Most matter on the earth exists as a solid, a liquid, or a gas. For instance, that fossil claw is matter in a solid state, water is matter in a liquid state, and the air we're breathing is matter in a gaseous state."

Tess took back the claw from Felix. "Most of the fossil bones we'll be excavating, Dr. Forester and I will study back in our lab at the university. Some of the smaller ones, though, we'll analyze right here. Part of analyzing fossils involves recording information about each one."

"What kind of information?" Kristal asked, quietly flipping open the book she'd brought along. Amy saw that its pages were filled with drawings and realized it was indeed a sketchbook.

5

Literal. How does Tess first define matter?

- » all the stuff in the universe

Evaluative. How does she later expand on that definition?

- » anything that has mass and takes up space

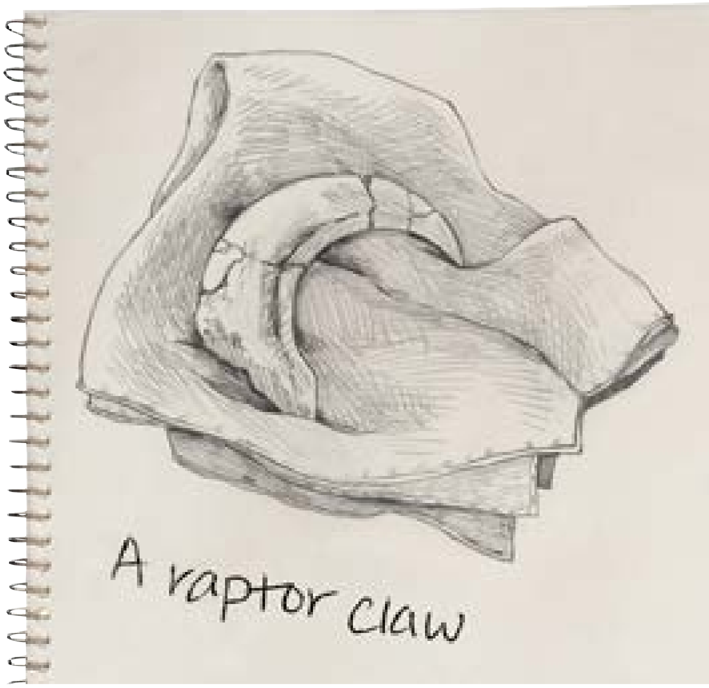
Evaluative. Based on that definition, is there anything we've encountered in the text that is *not* matter?

- » Answers will vary. Students may identify thoughts or feelings as things that do not have mass.

"We typically start by recording a fossil's physical properties. We can use our senses to describe the physical properties of a given type of matter. For instance, how would you describe this fossil claw?"

Kristal began sketching the fossil in Tess's hand. "It's has a smooth, curved surface," she said softly.

"Very good!" Tess said smiling. "Shape and texture—the roughness or smoothness of something—are physical properties of matter. Some fossils we find might be smooth like this claw, while others may be rough or pitted or have interesting marks on them."



6

"Marks?" Daria looked puzzled.

"Grooves, dents, or possibly bite marks made by predators."

"Awesome," Matt murmured.

"If color is a physical property, then we could record that the claw is really dark brown," Julian suggested.

Tess nodded. "Basically anything you can see, touch, taste, or smell is a physical property of matter."

"You really want us to taste and smell the fossils?" Felix asked, wide-eyed.

Tess burst out laughing. "That won't be necessary, Felix. But keep in mind that people see colors and describe textures differently. A fossil that looks dark brown to Julian might look different to someone else. Mass on the other hand," she continued, "is a physical property of matter that can be measured. Mass is the amount of matter in a substance or object. In fact, a formal definition of matter is anything that has mass and takes up space."

Tess stepped over to the table. "Mass is typically measured in metric units such as grams. We use a balance to measure the mass of small fossils such as this fossil claw." She placed the claw on the flat pan of the balance and slid the weight along its arm. "As you can see, the claw has a mass of 113.4 grams. If you don't know how to use a balance, I can show you later tonight."

"That's because right now," Dr. Forester said, gathering up the cloth bags and handing them out, "we are going to head out to the dig site. These bags contain tools that paleontologists use to excavate fossils. So grab your hats and let's go meet our dinosaur!"

Matt **nudged** Amy, and she saw the glow of excitement in his eyes. Amy wanted to feel excited too, but she wished she hadn't let Matt talk her into coming to Fossil Camp. She wished she was back home in Chicago instead of being stuck out here in such a hot place—a hot place with snakes.

7

Support

Amy saw the "glow of excitement" in Matt's eyes. Is "glowing" a physical property of Matt's eyes?

» Answers will vary but should lead to a reminder of "metaphor" as well as a reminder that emotions such as excitement are not matter.

Check for Understanding

Ask students to list the different physical properties of the fossil that the group investigates. (shape, texture, color, mass)

Identify Key Chemical Concepts

- Ask students to turn to Activity Page 1.2.
- Spend a couple of moments discussing with students how the table in the activity book is organized. In particular, point to (1) the use of rows and columns and (2) headings, as a way of organizing and dividing information.
- Model the completion of the table for the first term, *matter*. As you work, identify that you are using the more sophisticated definition that Tess provided.
- Once you have completed the example, ask different students, or volunteers, to suggest entries for the rest of the table. Ensure that they point to the relevant portion of the text. Ask students to fill in the table in their activity books as the class works.

Lesson 1: Entering the Badlands

Writing

20M

Primary Focus: Students will write detailed descriptions of the physical properties of objects. **TEKS 5.12.B**

DESCRIBE PHYSICAL PROPERTIES (20 MIN.)

Write Description of Object

- Ask students to pick an object. It can be in the classroom or from their imagination. It must qualify as "matter" according to the definition, and they must be able to describe its physical properties in sufficient detail for another to guess the object.
- If you have chosen objects in advance, ask students to pick them now, without showing or telling their partner what they have chosen.
- Tell students their task is to describe the matter just as a scientist would: by presenting factual information clearly and accurately. Point out that scientists only describe what they can observe or measure.

TEKS 5.12.B Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft.

Activity Page 1.2

Support

Write the following sentence on the board: "Matter is anything that has mass or takes up space, and can be in different states. Some examples of matter are a fossil claw, oranges, and water." Ask the students to comment on the difference between reading this information in sentence form and in the table.

ENGLISH LANGUAGE LEARNERS

Writing

Beginning
Give students an object to describe and use sentence frames to support their writing. (e.g., The object looks like ____, and is the color ____.)

Intermediate
Give students an object to describe and use verbal prompts to support their writing. (e.g., Does it smell? What texture does it have?)

Advanced/Advanced High
Ask students prompts only when they get stuck. Additionally, prompt them on the use of formal language. (e.g., "How might a scientist phrase that sentence?")

ELPS 5.G

- Ask students to write silently on Activity Page 1.3 for 10 minutes. Tell them *not* to write down what the object is on the page, or it will ruin their partner's ability to guess.

Partner Discussion

- Ask students to swap journals and guess the object. Students should discuss their guesses in pairs, and provide reasons from the description for their guess.

Check for Understanding

Ask for pairs who guessed correctly to raise their hands. Pick volunteers and ask one of the partners to read their descriptions. As they read, ask the class to identify examples of precise description. Ask the reader to describe how they organized their description.

Lesson 1: Entering the Badlands

Speaking and Listening

25M

Primary Focus: Students will discuss the presentation of content in three different texts. **TEKS 5.6.H; TEKS 5.9.D.ii; TEKS 5.9.D.iii; TEKS 5.13.D**

ANALYZE GEOLOGY TEXT (10 MIN.)

- Ask students to turn to Activity Page 1.4 and look at the reproduction of two pages from the Geology Reader. Ask students to read the material again and reacquaint themselves with the content.
- Remind students that the Geology Reader was an informational text that provided information on geology.

Support

Model the observation of physical properties using a new object in the classroom. Focus on the use of precise language to describe what you *observe*. Use the examples from the table the class completed earlier (state of matter, texture, shape, color) to describe the object. As you model, explain how you are organizing information and why.

Challenge

Ask students to describe at least four physical properties of the object. If time permits, they may add more.

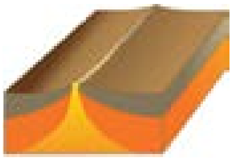
Activity Page 1.3

Activity Page 1.4

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.9.D** Recognize characteristics and structures of informational text, including (ii) features such as insets, timelines, and sidebars to support understanding; (iii) organizational patterns such as logical order and order of importance; **TEKS 5.13.D** The student is expected to understand the credibility of primary and secondary sources.

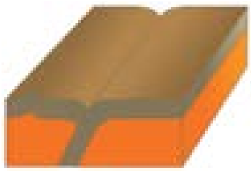
A Matter of Time

At some boundaries, tectonic plates are moving apart. As the plates separate, molten rock flows up from the mantle into the space between them, creating new crust. Mid-ocean ridges are an example of this type of plate interaction. Tectonic plates along the mid-ocean ridge in the Atlantic Ocean are moving apart at a rate of about 0.8 to 2 inches per year. That may not seem like much, but it adds up. Two hundred million years ago, the landmasses of North America and Europe were joined. So were South America and Africa. Thanks to separating plates, these continents now lie on opposite sides of a vast ocean.



Tectonic plates move apart.

At other plate boundaries, tectonic plates are **colliding**, or crashing together. In some places, colliding plates slowly crash into each other. The crust at their edges gradually crumples and is pushed higher and higher, creating mountains. In other places, one of the colliding plates slides under the other. Two plates are colliding this way along the western coast of South America. A heavier oceanic plate is sliding under a lighter continental plate. Scientists call this process **subduction**. Subduction has created a deep ocean trench off the coast of Chile and Peru. It has also had a role in creating the towering Andes Mountains along the western edge of South America. Similar plate interactions have formed mountain ranges throughout Earth's long history.



Tectonic plates collide.

Finally, tectonic plates slide sideways past one another. It's never a smooth process. Plate edges press together hard. They often get stuck while the

Tectonic plates slide sideways past one another.

20

- Ask students to Think-Pair-Share and consider how the text is presented and what characteristics of the text—both in content and organization—identify it as informational.
- Ask students to volunteer characteristics of the text that identify it as informational.
    - » Answers may vary, but could include: presentation of factual information, use of clear headings and subtitles to allow for the information to be presented clearly, and the use of diagrams. In the discussion, guide students to the conclusion that there is a clear purpose to the informational text: to convey information clearly and coherently.
- As the class discusses, list the characteristics of the Geology text on the left hand side of the board, under the heading "Informational."

ENGLISH LANGUAGE LEARNERS

Speaking and Listening

Beginning
For all three Think-Pair-Shares, offer students sentence starters to state their opinions. (e.g., I think this is an informational characteristic because ____.)

Intermediate
For all three Think-Pair-Shares, offer students more complex sentence starters to respond to their partner's opinion. (e.g., I agree that this suggests the text is informational, and ____.)

Advanced/Advanced High
For all three Think-Pair-Shares, offer nuanced sentence starters students can adapt during partner discussions. (e.g., I am not sure that is correct, because ____.)

ELPS 1.E; ELPS 3.G

pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Wegener's Pangaea broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.

As plates move, interesting things happen. Most of the time, they happen incredibly slowly. Sometimes, though, the effects of plate movements are sudden and dramatic. Think earthquakes and volcanoes!

Core Conclusions

You may never have heard of the Danish scientist Inge Lehmann. Among seismologists, however, she is famous. Around 1900, scientists thought the earth had just three layers: an outer crust, a solid mantle, and a liquid core. Lehmann studied seismograph records of earthquakes. She analyzed how seismic waves changed as they traveled through Earth's interior. Lehmann collected thousands of records organized in boxes—there were no computers back then! She saw patterns in how seismic waves behaved as they moved through Earth. Lehmann concluded that Earth's core has two parts: a liquid outer core and a solid inner core. In 1936, she announced her findings and changed our view of Earth!

ANALYZE CHEMICAL MATTER TEXT (15 MIN.)

- Now ask students to read again the first half of the text they read as a class today, "Welcome to Fossil Camp."
- Ask students to Think-Pair-Share and consider how the text is presented and what characteristics of the text–both in content and organization–identify it as a fictional narrative text.
- Ask students to volunteer characteristics of the text that identify it as fictional and narrative.
    - » Answers may vary, but could include: continuous prose, fictional characters, use of descriptive language to create setting, a narrative plot, and the lack of explanatory diagrams, charts, tables, etc.
- As the class discusses, list the characteristics of the literary text on the right-hand side of the board, under the heading "Literary."
- Finally, working in the same pairs, ask students to consider the second half of the text they read as a class, which explains chemical matter.
- Ask students to Think-Pair-Share and consider how the text is presented, as well as the characteristics of the text–both in content and organization.

Check for Understanding

Ask students to volunteer characteristics of the chemical matter text in "Welcome to Fossil Camp," in turns, asking for an example of the content and an example of organization.

- Tell students they will continue to compare and contrast the Geology text and the two halves of the Chemical Matter text.
- To wrap up, ask students to vote on whether they think the last piece of text they read is informational or literary. Tell them they will vote again tomorrow.
- Record the results of the vote for the next lesson. Keep on the board the list of characteristics for informational and literary texts.

End Lesson

Support

Students should look at the characteristics on the board. "Treasure hunt" to find an example in the chapter's second half. Provide guidance starting with "presentation of factual information" (informational list) and "fictional characters" (literary list).

Challenge

What effect does the way the Chemical Matter Reader is structured have on you, the reader?

Support

You may choose to spend a moment on the author's use of questions from the campers to elicit scientific information, modeling a dialogue between student and teacher.

LESSON

2

Scientific Stories

PRIMARY FOCUS OF LESSON

Reading

Students will compare and contrast the presentation of scientific content in two different texts. TEKS 5.6.H; TEKS 5.9.D.ii; TEKS 5.9.D.iii

Writing

Students will present factual information in narrative form.
TEKS 5.12.A

Grammar

Students will understand how to expand sentences. TEKS 5.11.C

Morphology

Students will understand how to use the suffix –*ment*. TEKS 5.2.A.iv; TEKS 5.3.C

Reading

Students will apply their understanding of literary and informational details to analyze a new text. TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.6.G

FORMATIVE ASSESSMENT

Activity Page 2.1	**Reasons the Text is Literary Like the First Half of the Chapter** Analyze differences in content presentation in the Chemical Matter and Geology units. TEKS 5.6.H; TEKS 5.9.D.ii; TEKS 5.9.D.iii
Activity Page 2.2	**Write a Narrative Containing Informational Content** Create narrative presentation of scientific content. TEKS 5.12.A
Activity Page 2.3	**Expand the Sentences** Expand sentences for meaning, interest, and style. TEKS 5.11.C
Activity Page 2.4	**–ment: Suffix Meaning a State of Being** Use the suffix –*ment* correctly. TEKS 5.2.A.iv; TEKS 5.3.C
Activity Page 2.5	**Analyze Details** Identify whether details in *The Badlands Sleuth* are literary or informational. TEKS 5.6.F; TEKS 5.6.G

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (20 min.)			
Compare and Contrast Two Texts	Partner	20 min.	❏ *The Badlands Sleuth* ❏ Activity Page 1.3, 2.1 ❏ Optional: Geology Reader
Writing (25 min.)			
Create Narrative for Scientific Content	Independent	20 min.	❏ Activity Page 2.2
Sharing Responses	Whole Group	5 min.	
Language (30 min.)			
Grammar: Expanding Sentences	Whole Group	15 min.	❏ Activity Page 2.3
Morphology: Suffixes	Independent	15 min.	❏ Poster: Suffixes (Digital Components) ❏ Activity Page 2.4
Reading (15 min.)			
Partner Read: Chapter 2, Part 1	Partner	15 min.	❏ Activity Page 2.5

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.9.D** Recognize characteristics and structures of informational text, including (ii) features such as insets, timelines, and sidebars to support understanding; (iii) organizational patterns such as logical order and order of importance; **TEKS 5.12.A** Compose literary texts such as personal narratives, fiction, and poetry using genre characteristics and craft; **TEKS 5.11.C** Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity; **TEKS 5.2.A.iv** Demonstrate and apply phonetic knowledge by: decoding words using advanced knowledge of the influence of prefixes and suffixes on base words; **TEKS 5.3.C** Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo; **TEKS 5.2.A.v** Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.6.G** Evaluate details read to determine key ideas.

ADVANCE PREPARATION

Reading

- Students have a copy of two pages from the Geology Reader from Grade 4 in their journals/notebooks. You may wish to borrow some Readers from this unit to extend the examples.
- You should still have on the board the characteristics of literary and informational text you wrote the previous day.

Writing

- This writing activity could be extended as a project for more than one lesson, with students creating a more complete version of a narrative or literary text. For this assignment, students should be able to show a rough draft of this work only.

Grammar

- Write the following sentences on the board:

Example 1

1. The badlands of eastern Montana were hot.
2. The badlands of eastern Montana shimmered in the heat under a pale, cloudless sky.

Example 2

1. I ate some pizza.
2. I eagerly bit into some pizza, enjoying the sensation of hot cheese dripping down my chin.
3. I reluctantly bit into the cold, slimy pizza, choking it down.

Morphology

- Prepare the poster below. Alternatively, access digital versions in the digital components for this unit.

A suffix is a syllable or syllables placed at the end of a root word to change the word's meaning.

Nouns are words that name people, places, or things (including ideas).

Verbs are words that describe an action.

Universal Access

- Replicate the list of informational/narrative characteristics from the previous lesson. Insert a column with a checkbox next to each characteristic. As students analyze the chemical matter text, ask them to place a tick or a cross next to each characteristic.
- In the list of informational/narrative characteristics, circle two or three narrative elements you wish for students to focus on in their writing.
- Write a list of adjectives and adverbs on board/chart paper to help students expand the sentences in their activity books. Some examples are below:
    - Sentence 1 adjectives: rugged, barren, lonely, solitary
    - Sentence 1 adverbs: reluctantly, sadly, eagerly, happily.
- Provide additional sentences, using the suffix –*ment*, on familiar and unfamiliar topics to help students decipher unfamiliar words. Some examples are below:
    - Getting a good grade was an achievement.
    - I looked at the fireworks with amazement. They were a real surprise.
    - I worked hard to get the two cars into alignment with each other.
    - I waited for my friend with excitement–he had promised we were going somewhere really cool!

ACADEMIC VOCABULARY

convey, v. to communicate

adapt, v. to modify to be suitable for a new purpose

perfect, v. to make perfect

analysis, n. careful examination or study of something

Activity Page 2.1

Support

Write on the board, "I believe this text is ___ because it has the following characteristics [list characteristics] which are commonly found in (literary/informational) texts. For example, in the (Geology Reader/literary text), you encounter ___.

ENGLISH LANGUAGE LEARNERS

Reading
Understanding Text Structure

Beginning
Focus students on two narrative and two informational characteristics, i.e., sequential organization and the use of continuous prose vs. factual information and use of bullets.

Intermediate
Ask students to look at each informational and narrative characteristic on the chart/board paper and say in each case if it applies to the texts.

Advanced/Advanced High
Ask students prompting questions, e.g., Which of the characteristics on the board can you see in this text?

ELPS 4.F

Start Lesson

Lesson 2: Scientific Stories

Reading

20M

Primary Focus: Students will compare and contrast the presentation of scientific content in two different texts. **TEKS 5.6.H; TEKS 5.9.D.ii; TEKS 5.9.D.iii**

COMPARE AND CONTRAST TWO TEXTS (20 MIN.)

Compare Geology and Chemical Matter

- Remind students that in the previous lesson they read and discussed text from the Geology unit and also looked at the two halves of the first chapter of the chemical matter unit.
- Ask students to spend a moment reading the list on the board describing the characteristics of informational and literary texts and consider whether the different texts they discussed in the previous lesson are literary, or informational, texts.
- Ask students to now return to the second half of the chapter on chemical matter, and work in pairs to complete worksheet Activity Page 2.1.
- Discuss student answers briefly as a class.

Wrap-Up

- Wrap up with a second class vote on whether *The Badlands Sleuth* should be considered informational or literary. Remind students of the vote count from the previous day. If the numbers have changed, ask students for reasons why they have changed their mind.
- Finally, tell students that there is no right answer: this is a text that combines elements from informational and literary texts. Because they have studied literary and informational texts all year, they are now able to read and analyze a text that combines both elements.
- You may wish to point out that writing does not always have to fit clear rules, as long as it achieves its purpose.

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.9.D** Recognize characteristics and structures of informational text, including (ii) features such as insets, timelines, and sidebars to support understanding; (iii) organizational patterns such as logical order and order of importance.

Check for Understanding

Ask students what purpose this text might have in combining both literary and informational characteristics.

Lesson 2: Scientific Stories

Writing

25M

Primary Focus: Students will present factual information in narrative form.

TEKS 5.12.A

PRESENTING IN NARRATIVE FORM (20 MIN.)

- Tell students they will apply their analysis by presenting information in different forms. Ask them to turn to and complete Activity Page 2.2.
- Students should not be expected to complete more than a rough first draft in the time available. As noted in the advance preparation, this writing activity can be extended to additional activities, continued at home, or used as written.
- However you choose to use this writing activity, students should demonstrate they understand and can use the characteristics of literary text (including continuous prose and use of character, plot, and setting).
- If students become stuck, encourage them to keep writing even if they think the content is not "right."
- You may wish to ask students to continue this at home and revise their first draft.
- As students work, circulate and check in.

SHARING RESPONSES (5 MIN.)

- If time allows, ask a couple of volunteers to share out their work. Remind the rest of the class how to listen and respond respectfully and constructively.

TEKS 5.12.A Compose literary texts such as personal narratives, fiction, and poetry using genre characteristics and craft.

Challenge

Imagine that the same content was conveyed in the text without the existence of Tess or the Campers. What do you think would change about how you, the reader, thought about the text and the content?

Activity Page 2.2

ENGLISH LANGUAGE LEARNERS

Writing
Writing

Beginning
Give students two narrative characteristics to include (i.e., continuous prose, characters) and one informational (factually correct information). Plan together how to incorporate them.

Intermediate
Ask students to identify two narrative characteristics to include, and plan together how to incorporate them.

Advanced/Advanced High
Ask students to describe their plan for incorporating narrative/informational characteristics. Prompt them using the information on the board/chart paper.

ELPS 5.G

Support

Review the list on the board describing the elements of literary and informational texts with students. Ask them to identify which characteristics they are choosing to organize their writing, and how that might be applied.

Support

Provide some example settings and plot lines to help the students.

ENGLISH LANGUAGE LEARNERS

Language
Language

Beginning
Offer students example adjectives and adverbs for their sentences, asking to choose two they think appropriate (e.g., *slowly* or *reluctantly* in front of *walked*).

Intermediate
Provide students with a sentence; ask to swap the adjectives and adverbs to turn sentence into a "weird" experience (e.g., *Driving around lunar rocks*).

Advanced/Advanced High
Ask students to provide two alternative sentences with different descriptive details, asking to describe their different effect. Turn one sentence into a "weird" experience.

ELPS 5.G

Support

You may wish to remind students of what adjectives are and offer some examples.

Check for Understanding

Ask students to identify a literary detail used in the volunteer's story.

Lesson 2: Scientific Stories

Language

30M

GRAMMAR: EXPANDING SENTENCES (15 MIN.)

Primary Focus: Students will understand how to expand sentences. TEKS 5.11.C

Model

- Tell students that they will explore how to adapt sentences to make their meaning clearer or more powerful. They will be looking at three methods for adapting:
    - expanding sentences
    - reducing sentences
    - combining sentences
- Tell students these are not methods you can "perfect." Professional writers are always working on making their sentences more effective, and there is a huge range of styles within fiction and non-fiction writing.
- Tell students that writers often think of the following when they are constructing their sentences:
    - What is the purpose of my writing?
    - What do I want readers to understand or feel?
- Show students the following examples (adapted from the first paragraph of the Reader) on the board/chart paper:
    - The badlands of eastern Montana were hot.
    - The badlands of eastern Montana shimmered in the heat under a pale, cloudless sky.

TEKS 5.11.C Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity.

1. What is the difference between the first sentence and the second sentence?
    » Answers may vary but should identify additional verbs and adjectives.
2. Why do you think the extra detail might have been added?
    » Answers will vary, but may include: to allow the reader to imagine or visualize the scene better; to make the reader feel they were there with the character; or to be more precise in the description of the setting.

- Tell students that writers often add in descriptive detail, particularly in narrative and other literary texts.

Support

You may wish to identify that the writer has added clauses to their sentences.

Model 2

- Show students a second example.
    - I ate some pizza.
    - I eagerly bit into some pizza, enjoying the sensation of hot cheese dripping down my chin.
    - I reluctantly bit into the cold, slimy pizza, choking it down.

1. What is the same about the second and third sentences?
    » In each case, the character ate some pizza.
2. What is different about them?
    » In the second sentence, the pizza is enjoyable. In the third, it is not.

- Ask students to identify words and phrases that allowed them to identify the differences.
- Point out to students that in all three sentences, we are told that pizza was eaten. However, by expanding the sentence through the addition of details, the writer was able to convey more information and make the sentence more interesting.

Practice

Activity Page 2.3

- Ask students to turn to Activity Page 2.3 and expand the sentences. Remind them they have a lot of freedom, but they should think about the precise words and details they wish to add, paying particular attention to adjectives.
- The sentences students are expanding are below:
    - Amy walked into her tent.
    - Matt listened to Tess's explanation.
    - I drove round the rocks.
- Discuss student answers briefly as a class.

- Remind students that they should still only have one sentence.
- You may wish to ask students to continue at home.

Check for Understanding

Ask a volunteer to share one of their sentences. Ask other students to identify descriptive details used to expand the sentence.

ENGLISH LANGUAGE LEARNERS

Language
Reading/Viewing Closely

Beginning
Provide additional sentences on familiar topics to allow students to decipher unfamiliar words, e.g., "getting a good grade was an achievement."

Intermediate
Provide additional sentences on topics related to the Reader to allow students to decipher unfamiliar words, e.g., "Amy cracking the case was an achievement."

Advanced/Advanced High
Provide additional sentences without the suffix on unfamiliar topics to allow students to decipher unfamiliar words, e.g., "I am enforcing the law laid down by this government."

ELPS 1.H; ELPS 4.F

Support

Remind students that once a suffix has been added to the beginning of a root word, the word is affixed.

MORPHOLOGY: SUFFIXES (15 MIN.)

Primary Focus: Students will understand how to use the suffix –*ment*.

TEKS 5.2.A.iv; TEKS 5.3.C

Model

- Write the following words on the board:
    - excite
    - amaze
    - disagree
    - judge
    - entertain

1. What are suffixes?
    » Suffixes are letters that change the meaning of a root word when they are added to the end of that word.

- Tell students that the suffix –*ment* means "in the state of being ____." For example, *excitement* means "in the state of being excited," and *amazement* means "in the state of being amazed."
- After writing *excite* and *amaze* on the board, write –*ment* in a different color.

2. What part of speech are *excite* and *amaze*?
    » verb

3. Is *excitement* a verb? If not, what part of speech is it?
    » No. It is a noun.

- Tell students that adding –*ment* will turn a verb into a noun.

TEKS 5.2.A.iv Demonstrate and apply phonetic knowledge by: decoding words using advanced knowledge of the influence of prefixes and suffixes on base words; **TEKS 5.3.C** Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

MODEL

- Ask students to start Activity Page 2.4 and complete it at home.

Activity Page 2.4

Check for Understanding

Take a few minutes, as a class, to brainstorm words that can have –*ment* added to the end of them.

Lesson 2: Scientific Stories

Reading

15M

Primary Focus: Students will apply their understanding of literary and informational details to analyze a new text.

TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.6.G

PARTNER READ: CHAPTER 2, PART 1 (15 MIN.)

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 2. They will read the first half only.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

gesture, n. a movement, usually the hand or head, to express meaning or point to something; can also be a verb

embed, v. fixed deeply into the surrounding mass

plateau, n. an area of high, level (no slope) ground

technique, n. a way of doing something, usually with some skill

devour, v. to eat fast and hungrily

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.6.G** Evaluate details read to determine key ideas.

ENGLISH LANGUAGE LEARNERS

Reading
Reading/Viewing Closely

Beginning
Work with students to complete the activity and provide criteria for informational and literary text, e.g., "Is this factual information? Are these imaginary characters?"

Intermediate
Work with students to complete the activity, discussing the list of informational and literary characteristics they used in this lesson and the previous lesson as you work.

Advanced/Advanced High
Give students support as needed, and ask them to check through the list of informational and literary characteristics as they complete the activity.

ELPS 4.D; ELPS 4.K

Activity Page 2.5

Vocabulary Chart for Chapter 2, "A Bed of Bones"

Vocabulary Type	Tier 3 Domain-Specific Words	Tier 2 General Academic Words
Core Vocabulary	plateau	gesture embed technique devour
Multiple-Meaning Core Vocabulary Words		
Sayings and Phrases		

Partner Read

- Tell students they will apply the analysis from the previous two lessons on informational and literary text, and how it is organized, to a new chapter.
- Ask students to read the chapter in pairs. As with previous units, you may pair students a number of ways. They will read up to "a good example of chemistry in action." on page 11 of the Reader.
- Explain that both students will read the first page silently, and then one partner will read that page aloud. Next, they will both read the second page silently, and then the other partner will read that page aloud, and so on. Students can ask their partner for help with sounding out or defining words as necessary.
- As students read, they should complete Activity Page 2.5, taking home to complete if necessary.

Check for Understanding

Ask students to identify the clue that Amy is still uncomfortably hot (she "edges towards" the one square of shade.) Ask students if this is a literary detail of the text, or an informational detail of the text. Students should be able to identify that this clue gives information about Amy's character and experience and is therefore a literary detail.

Chapter 2

A Bed of Bones

THE BIG QUESTION
How can water, ice, and vapor be the same thing?

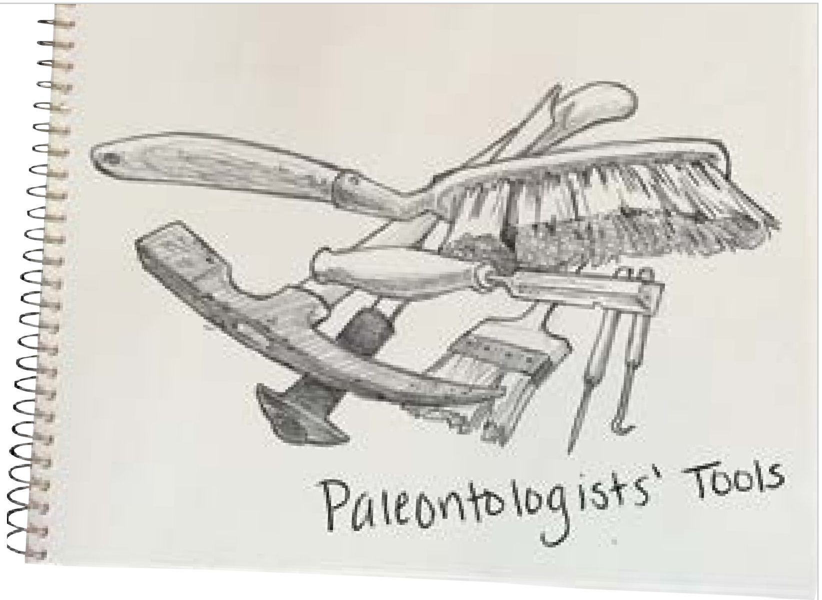
"Meet *Acheroraptor temertyorum*," Dr. Forester said, gesturing down at the dark fossils **embedded** in the pale rock at their feet. "He lived in this part of North America about 66 million years ago, along with other dinosaurs such as *Tyrannosaurus* and *Triceratops*. Tess and I call him Achy-Breaky for short: Achy for the first part of his scientific name, *Acheroraptor*, and Breaky because some of his fossil bones are broken up into pieces."

'No kidding!' thought Amy. She had expected the dinosaur skeleton to be nicely laid out like those she'd seen in museums. Instead, different fossil bones were angled this way and that, like a jumble of large and small puzzle pieces. She edged further into the square of shade cast by the blue plastic tarp that had been strung over the dig site. It was situated on a narrow **plateau** about halfway up a rocky ridge, completely **exposed** to the **blazing** afternoon sun.

Julian pulled out a rock hammer and a small chisel from his cloth bag. "So, do we use these to chip the fossils out of the rock?"

Dr. Forester shook her head. "Paleontologists use a hammer and chisel to break apart big chunks of rock or in places where there's no chance of damaging fossil bones. Once fossils are partially exposed, like they are here, we switch to smaller tools designed for more delicate work." She held up a slim metal pick and a small paintbrush. "In your tool bags, you'll find a pick like this for scraping away rock and a brush to whisk the rock dust away."

"Dr. Forester and I will demonstrate how to use these tools correctly on this leg bone we're working on," Tess explained, kneeling beside a long, narrow fossil. "Please listen and watch closely." She and Dr. Forester used their picks to scrape and scratch at the rock where it met the fossil.



“This rock is a type of sandstone and quite soft and crumbly. Excavating fossils like this is time-consuming, but not particularly difficult. It just takes patience,” Dr. Forester said. She used her brush to gently clean the area where she’d been working. “Every few minutes, use your brush like this to clear away the rock dust so you can see what you’re doing,” she added.

Amy and the other campers watched intently for a few minutes. Then it was their turn.

“Working with a partner,” Dr. Forester instructed, “Tess and I want you to choose a bone that you’d like to excavate together. Tess and I will work with you to make sure you’re getting the hang of it.”

Amy followed Matt, who made a beeline for the dinosaur’s jawbone at the far edge of the dig site. Julian and Kristal chose bones that Dr. Forester said were part of a foot, while Felix and Daria settled on a short chain of bones that were unmistakably part of the dinosaur’s backbone.

9

Support

From the context, what do you think *excavate* might mean?

» Students should be able to point to the actions being taken and infer that *excavate* means “removing rock (or earth) carefully to expose something buried.”

Challenge

What prefix is used to show that Felix and Daria’s bones were definitely backbones?

» –*un* before *mistakably* to make *unmistakably*

Matt began using his pick to very carefully scrape away the rock around one of the teeth that were embedded in the jawbone. "These teeth still look sharp!" he exclaimed.

Amy ran a finger around the bony edge at the back of the jawbone. It seemed as good a place to start as any, so she got out her tools and set to work.

Dr. Forester and Tess came around every so often and checked how everyone was doing. When they were confident that all the campers had the **technique** down, they worked together on the leg bone. For more than two hours, the only sounds were the scratch of picks and the swish of brushes, the buzz of flies, and the wind sighing through the dry grasses that grew along the edge of the plateau.

Julian broke the silence by asking what Amy thought was a strange question. "Dr. Forester, if I wanted to be a famous paleontologist, what would I need to do?"

She considered the question for a minute. "Well, finding a new type, or species, of dinosaur might make you famous—at least among other paleontologists. But there's a lot of luck involved in fossil discoveries, Julian, and really important discoveries are few and far between. I'm afraid you can't just set out to become famous and expect it to happen."

Julian frowned. "My dad's famous. He owns four restaurants in Dallas. And my brother is famous, too, because he plays football for a big university team. If we discover something new, I sure hope I'm the one to find it."

Dr. Forester didn't seem to know what to say. But Felix had perked up at the mention of restaurants. "Speaking of food," he said, "is there anything to eat? Excavating fossils is hungry work."

"Let's take a break," Tess offered, and led them to the far end of the plateau where the ridge formed a wall high enough to create a patch of shade. Everyone sat with their backs against the rock wall and stretched their legs out in front of them as Tess passed out bottles of water and energy bars from the cooler. Felix **devoured** one bar and started on another before anyone else had taken a bite. Amy wondered if he was always so hungry.

10

Munching slowly, Daria pulled out her phone and then frowned down at the screen. “No signal here, either.”

“The cell coverage is pretty spotty,” Dr. Forester explained, “so I’m afraid cell phones are fairly useless out here.”

“It’s no big deal,” Daria said quickly. “I just miss my mom—I mean, I was just wondering what my friends are doing right now, that’s all.” She slipped her phone back into her pocket.

Julian helped himself to another bottle of water from the cooler. “The ice is melting fast in this heat.”

“A good example of chemistry in action,” Tess said.

“Chemistry?” Felix mumbled, swallowing the last bite of his third energy bar. “What does melting ice have to do with chemistry?”

“Remember that chemistry is the study of matter and how it changes,” Tess said. “Solid ice melting to liquid water is an example of a physical change in matter in which matter changes from one state to another. Ice is water in its solid state. When ice melts, water undergoes a physical change, going from a solid state to a liquid state.” Tess gestured toward the ice chest. “Suppose we poured that water out on the ground here. What do you think would happen to it?”

Kristal raised her hand hesitantly. “The water would gradually dry up and disappear, like rain on the pavement does when the sun comes out.”

“Well, it might seem like it is disappearing,” Tess replied. “But matter can’t be created or destroyed. The water would slowly change states again, this time changing from a liquid to an invisible gas called water vapor that floats up into the air.”

“You mean it **evaporates,**” Amy offered.

“Yes, that’s the term,” Tess replied. “A similar change in state from liquid to gas takes place when water boils.”

11

End Lesson

LESSON

3

Scientists and Detectives, Part 1

PRIMARY FOCUS OF LESSON

Reading

Students will integrate multiple sources to explain the concept of chemical states. **TEKS 5.6.H; TEKS 5.7.E; TEKS 5.13.C**

Writing

Students will appropriately organize information to track character development. **TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B**

FORMATIVE ASSESSMENT

Activity Page 3.2	**The Water Cycle** Use information from Reader and additional chemical content to explain changes in state. **TEKS 5.6.H; TEKS 5.7.E; TEKS 5.13.C**
Activity Page 3.3	**Character Maps** Organize and populate character maps to show character development. **TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B**

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (45 min.)			
Word Work: *Achy Breaky*	Partner	5 min.	❏ *The Badlands Sleuth* ❏ Changes in State Diagrams ❏ Activity Pages 3.1, 3.2
Read Chapter 2, Part 2	Whole Group	15 min.	
Integrate Information	Small Group	25 min.	
Writing (45 min.)			
Organization of Content	Whole Group	15 min.	❏ Activity Pages 3.3, 3.4 ❏ Sample Character Maps (Digital Components) ❏ Tess's Rules for Observation (Digital Components) ❏ Inspector Ellis's Rules for Detection (Digital Components)
Creation of Character Maps	Small Group	20 min.	
Discussion	Small Group	10 min.	

ADVANCE PREPARATION

Reading

- You may wish to print out additional copies of the "changes in state" page found in the Teacher Resources section of this Teacher Guide. Alternatively, you may access digital versions of this in the digital components for this unit. It is also in student activity books.
- The annotation activity can be extended by asking students to use additional resources from the library, the Internet, or science class. If you do this, review the use of appropriate and reliable sources first.

Writing

- This lesson contains a Think-Aloud activity. During a Think-Aloud, make your thinking visible to students by modeling the steps to solving a problem or completing a task. As you "think aloud" while working through an activity, students observe your approach to finding information, drawing conclusions, considering questions, and testing ideas.
- Display or copy the four sample character maps for Matt in the Teacher Resources section of this Teacher Guide. Alternatively, access digital versions of these in the digital components for this unit.
- Please note that students will be building on Kristal and Julian's character maps in Lesson 6, so each student should complete a map for at least one of these characters. You may wish to assign more advanced students to Julian.
- Review "Tess's Rules for Observation" and "Inspector Ellis's Rules for Detection" found on Activity Page 3.4 and below. Alternatively, access digital versions of these in the digital components for this unit.

Tess's Rules for Observation

Tess's Rules for Observation

When I started studying chemistry, the first thing I had to learn was how to notice things properly. My rules for observation are:

1. Look carefully at everything.
2. Record what you can: mass, color, texture, state.
3. Look at how things change. If you heat it up, what happens? If you add another substance, what happens?

4. Ask, "Does what I observe match the theory?" Great scientific discoveries happen when scientists notice things not behaving the way they thought they would. Do you see anything strange?
5. If you have a theory, test it across as many examples as you can. The more evidence you have to back up your ideas, the better.

Try applying the rules to this example: if I wanted to understand the properties of salt, I would ___.

Inspector Ellis's Rules for Detection

Inspector Ellis's Rules for Detection

There's a reason I'm Amy's favorite detective. I am brilliant. No case goes unsolved if Inspector Ellis is called in. (Well, there was that one case with the umbrella and the penguin, but I don't like to talk about it.)

Obviously, you can't become as brilliant as I am (Did I mention I was brilliant?) overnight. But you can start down the long, lonely path of becoming a great detective by following my rules of observation.

1. Look at everything. Write down what you see.
2. Collect what you can and analyze it—fingerprints, lipstick stains, everything. (You can send it to the chemistry people in the lab.)
3. If you've seen the crime scene before, compare what you see now with what you saw before.
4. Does anything seem out of place or unusual?
5. Interview everyone. Do their stories match up? Does anything seem out of place?
6. Is anyone behaving strangely? You can't arrest someone for being nervous, but it might give you an idea of what to look for and where.
7. Do you have a theory? Can you test it? For example, in my last case, I thought it was possible the thief had stolen out through an air vent. I tested if this was possible by sending my sidekick through the vent. I was wrong, and my sidekick became stuck—but I'd never have known this without testing my theory! (He quit later; some people can't cope with the challenge of this job.)

Universal Access

- Provide students needing substantial support with the following sentence frames for them to use as they annotate the water cycle:
    - "In evaporation, water goes from a ______ state to a ______ state. The diagram that shows a ______ state is ______, and the diagram that shows a ______ state is ______."
    - "In condensation, water goes from a ______ state to a ______ state. The diagram that shows a ______ state is ______, and the diagram that shows a ______ state is ______."
    - "In precipitation to snow, water goes from a ______ state to a ______ state. The diagram that shows a ______ state is ______, and the diagram that shows a ______ state is ______."
    - "In melting, water goes from a ______ state to a ______ state. The diagram that shows a ______ state is ______, and the diagram that shows a ______ state is ______."
- Copy the diagrams showing solid, liquid, and gaseous states and pair them to show solid to liquid, liquid to gas, and gas to solid. Provide these on pieces of paper with the correct titles (for example, "solid to liquid") to allow students to place them on their annotated diagram.
- After the class discussion, and before students begin designing their maps, provide students who need substantial support with a bulleted list of advantages and disadvantages for each of the different organizations of the character map you have displayed. For students needing moderate support, provide them with the list for the first version, then prompt them as needed. Advantages and disadvantages are listed below:
    - **Version 1.** Advantages: (1) You can see information clearly through headers and bullets. (2) Information is clearly categorized. (3) You can add more information easily. Disadvantages: (1) You cannot see changes over time easily. (2) If there is another "category" it is not easy to add.
    - **Version 2.** Advantages: (1) You can see information clearly through headings and bullets. (2) Information is clearly categorized. (3) The character map allows you to add more information easily, including another category. (4) The character map allows you to see changes over time. Disadvantage: (1) It is hard to make connections between different ideas.

- **Version 3.** Advantages: (1) The character map allows you to easily see connections between characters. (2) The character map allows you to compare and contrast between characters. Disadvantages: (1) It is hard to keep adding information as you discover it. (2) The map doesn't allow you to categorize kinds of information easily.

- **Version 4.** Advantages: (1) The character map is easy to read. (2) You can see changes in the map over time. Disadvantages: (1) Information is not clearly categorized. (2) There are no organizational tools (for example, headers and bullets) to help you categorize. (3) It is not always easy to see links between ideas.

ACADEMIC VOCABULARY

integrate, v. combine more than one thing to make a new whole

concept, n. idea

device, n. a literary device: method authors use to convey information

annotate, v. add notes to text or diagram to give an explanation

perspective, n. a way of looking at something

Start Lesson

Lesson 3: Detectives and Scientists, Part 1

Reading

45M

Primary Focus: Students will integrate multiple sources to explain the concept of chemical states. **TEKS 5.6.H; TEKS 5.7.E; TEKS 5.13.C**

WORD WORK: *ACHY BREAKY* (5 MIN.)

- Remind students that in the first lesson they discovered that Greek and Latin were often used to create new scientific names and terms.
- Ask students to return to Chapter 2, which they began to read and analyze in the previous lesson. Read aloud the first three words of the chapter, "Meet *Acheroraptor temertyorum.*"
- Ask students to turn to Activity Page 3.1, read the instructions, and complete the activity.

Activity Page 3.1

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

READ CHAPTER 2, PART 2 (15 MIN.)

Vocabulary

- Ensure that each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 2. They will read the remaining text from "A good example of Chemistry in action" on page 11 of the Reader.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

gesture, n. a movement, usually of the hand or head, to express meaning or point to something.

evaporate, v. turn from liquid into vapor

portable, adj. easy to carry

mammal, n. a type of animal (humans are mammals)

Vocabulary Chart for Chapter 2, Part 2: "A Bed of Bones"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	evaporate mammal	gesture portable
Multiple-Meaning Core Vocabulary Words		
Sayings and Phrases		

Munching slowly, Daria pulled out her phone and then frowned down at the screen. “No signal here, either.”

“The cell coverage is pretty spotty,” Dr. Forester explained, “so I’m afraid cell phones are fairly useless out here.”

“It’s no big deal,” Daria said quickly. “I just miss my mom—I mean, I was just wondering what my friends are doing right now, that’s all.” She slipped her phone back into her pocket.

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“A good example of chemistry in action,” Tess said.

“Chemistry?” Felix mumbled, swallowing the last bite of his third energy bar. “What does melting ice have to do with chemistry?”

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Kristal raised her hand hesitantly. “The water would gradually dry up and disappear, like rain on the pavement does when the sun comes out.”

“Well, it might seem like it is disappearing,” Tess replied. “But matter can’t be created or destroyed. The water would slowly change states again, this time changing from a liquid to an invisible gas called water vapor that floats up into the air.”

“You mean it **evaporates,**” Amy offered.

“Yes, that’s the term,” Tess replied. “A similar change in state from liquid to gas takes place when water boils.”

11

Whole Group Read

- Have students read page 11 silently.

  Literal. What are the three states of water?

  » ice in solid state, water in liquid state, and water vapor in gas state

Challenge

What event or plot device does the author use to introduce more chemical content? (Clue: what do the campers do just before Tess explains more chemistry to them?)

Challenge

Ask students to name everyday examples of water in different states. In each case, ask about the temperature or environment (for example, it gets icy when it’s cold; the kettle heats water into steam).

“So if ice, water, and water vapor are all the same kind of matter, what explains the different states?” Matt asked.

“Excellent question, Matt,” Tess replied. “All matter is made up of small particles, so small that they can’t be seen with the naked eye. Whether a type of matter is in a solid, liquid, or gaseous state depends on how tightly packed these particles are, and how much energy they have. In a solid, such as an ice cube, the particles are crammed together. They can wiggle, but they don’t have enough energy to do much more than that. A solid keeps its shape because its particles are in such fixed positions.”

Tess took a sip of water from her bottle. “Matter in liquid form, like the water in this bottle, has particles that are farther apart than those in a solid. They have more energy, too, enough so they move freely, and slip and slide past each other. That’s why liquids flow. Matter in a liquid state doesn’t have a fixed shape. It takes the shape of whatever space it occupies.” She held up her bottle and tipped it from side to side.

“Matter in gaseous form,” Tess continued, “is made up of particles that are farther apart than those in a liquid and much farther apart than particles in a solid. And they have more energy, too. There is so much space between gas particles that they move very freely and rapidly in different directions. A gas spreads out to fill whatever space is available.” Tess spread her arms wide. “And here in Montana, we have lots of space!”

Julian scooped up a handful of the cold water in the bottom of the cooler and splashed it onto his face. “So my question is, how do we get more ice? I’m not too keen on drinking warm water.”

“Fortunately, physical changes in matter are reversible,” Dr. Forester chimed in. “Matter changes state when heat is added or taken away. For example, ice melts as it gets warm. Chill that water down by removing heat, and it turns back into ice. That’s what our **portable**, battery-powered refrigerator back at camp can do. It keeps our food cold and even makes ice.” She glanced at her watch. “How about we work for another half hour or so, and then head back to camp for dinner?”

12

Evaluative. What does all matter have in common?

» It is all made up of tiny particles. (Students might also cite the definition from yesterday—it occupies space and has mass.)

Literal. What two factors does Tess say decide whether matter is in a solid, a liquid, or a gas state?

» how much energy the particles have and how tightly they’re packed together

“Dinner! Yes!” Felix cried, pumping his fist in the air.

“But you just ate three energy bars,” Daria said, looking amazed.

“That was nothing,” Felix replied, “because in a half hour I’ll most certainly be starving again. My mom says I burn calories really fast because I never sit still.” He leaped up and started doing a little dance along the edge of the plateau.

It seemed to Amy that what happened next unfolded in slow motion. Just as Dr. Forester called out for Felix to be careful, part of the rock ledge where he was dancing gave way. Felix swayed, trying to keep his balance. His eyes grew wide and, in the next instant, he was gone.

Everyone scrambled to the edge and looked down. Felix was sitting at the bottom of the gully about ten feet below, with a surprised expression on his face.

Dr. Forester’s face was dark with worry. “Felix, are you all right?”

Felix jumped to his feet and started dusting himself off. “I’m fine,” he called up, grinning. “I didn’t really fall; I just scooted down on my backside.” He started to climb the slope, but paused to pick something up from the gravelly bottom of the gully.

“What do you make of this, Dr. Forester?” he asked when he was back on the plateau. He held up what looked to Amy like a dark, oblong rock.

Dr. Forester gripped him by the shoulders. “Never do anything like that again,” she said sternly. “You could have been hurt.” Then she looked carefully at Felix’s find. “It’s definitely a piece of fossil bone,” she said slowly, turning it over and over in her hands. She nodded toward the gully. “I think I’ll hike down there and have a quick look around.”

Fifteen minutes later she was back with several more small fossil **fragments**. Everyone gathered around as she laid them out on the ground.

13

"What kind of animal are they from?" Kristal asked, pulling out her sketchbook and beginning to make drawings of the bones.

Dr. Forester shook her head. "I won't really know until I've looked at them more closely. Let's pack up our gear and head back."

***

Back at camp, Amy and Julian helped Tess make spaghetti in the tent that served as a kitchen. When dinner was ready, everyone gathered around a table set up outside. Tess went to the lab to get Dr. Forester, but she came back alone. "Dr. Forester says she'll eat later after she's done studying those little bones."

The sun set while they were eating and a cool breeze sprang up. When they had finished dinner, Kristal and Matt did the dishes, and Tess built a huge campfire with thick chunks of wood. Everyone gathered around the fire, and Amy was surprised how good the heat from the flames felt as the temperature kept dropping.

Suddenly the fire popped and sparks shot up into the air.

"Whoa!" Daria said, scooting back a few feet. "I think a log just exploded!"

"It did, because water changed states," Tess said quietly.

"What? Chemistry again?" Felix teased.

Tess just smiled. "Logs often have small pockets of water and sap in them. As the logs start to burn, the liquid gets hot enough to boil and changes states to become a gas. But the gas is trapped inside the log. Pressure builds as the gas gets hotter until at some point the wood gives way with a *pop* and the hot gas escapes."

Just then they heard footsteps, and Dr. Forester appeared in the firelight. "Those little fossil bones are very interesting," she said. "I'm thinking they might belong to a small dinosaur, rather than an ancient **mammal** or bird, but unfortunately I don't have enough pieces yet to be sure."

"I want to look at them!" Julian said, jumping up from his chair and heading for the lab.

Dr. Forester caught him by the shoulder. "If you don't mind, Julian, let's wait until morning. It's really time for everyone to head for bed."

Julian shrugged and **reluctantly** said, "Okay."

As Amy walked with Kristal and Daria to their tent, she suddenly remembered the snakes. Were snakes coming out of their daylight hiding places now that it was cooler? With one eye peeled for anything slithery, Amy brushed her teeth with water in a cup and spat the minty foam onto a rock beside the tent. Then she checked to make sure there was nothing in her sleeping bag before crawling inside.

Daria and Kristal were quickly asleep, but Amy lay stiffly on her cot, listening for rustling sounds. Finally, she got up and shone her flashlight into every corner of the tent, under all the cots, and then zipped up the tent flap. She was pretty sure there was no other way for snakes to get in.

Even then, though, sleep refused to come. Amy flicked on her flashlight and pulled out one of the books she had brought along: *The Mystery of the Old Masters*. She had read the book many times, but she never tired of reading how Inspector Ellis figured out who'd stolen the priceless paintings. She thought it was clever the way the Inspector kept track of clues on a small notepad and consulted this list often. After finishing the first chapter, Amy felt better. She just wished that instead of Fossil Camp she could have gone to Detective Camp, if there was such a thing.

15

Inferential. If you took a block of ice out of a bottle and put it in a different shape bottle, would you expect the shape of the ice to change? Why or why not?

» No—ice is a solid. Its particles are tightly packed together and can't move, so it keeps the same shape.

Inferential. Tess says that, as the water in the logs becomes a gas, "pressure builds" until at some point the wood gives way. What have we been told about gas particles that might help explain what causes the wood to give way?

» Students should reference the gas "filling in whatever space is available" and moving very freely and rapidly to suggest exerting pressure on the log.

Activity Page 3.2

Support

Model the first example by asking (1) What state is water in the sea? (2) What state is it turning into? (3) Which diagrams describe each state? (4) What does the text say happens when the water changes state?

ENGLISH LANGUAGE LEARNERS

Reading
Reading/Viewing Closely

Beginning
Use sentence frames to describe changes in state (e.g., In evaporation, water goes from a ____ to a ____.)

Intermediate
Provide students with paired diagrams on different states, and ask them to apply them to the water cycle.

Advanced/Advanced High
Prompt students as necessary (e.g., "which state does this start and end in?").

ELPS 4.D; ELPS 4.J

INTEGRATE INFORMATION (25 MIN.)

Changes in State

- Remind students that, in the previous two lessons, they analyzed different presentations of scientific content. Today they will use scientific information presented differently, but on the same topic, to explain changes in state.
- Divide students into small groups. Ask them to turn to Activity Page 3.2 and review the two sets of diagrams: the water cycle and the "chemistry textbook" showing images of solids, liquids, and gases.
- Ask students, in turn, to comment on what they see in the diagrams for solids, liquids, and gases. Ask students to describe the difference in how the particles look, and ask them to point to the information in *The Badlands Sleuth* that describes the image.

Annotating Water Cycle

- In their small groups, ask students to complete the exercise described on Activity Page 3.2. You may wish to ask one member of each group to complete part of the diagram (*evaporation, condensation, precipitation,* and *melting*, respectively) and then discuss and combine their answers.
- Tell students that often they will not find all the information they need from a single source. By *integrating* the information from different sources, they come to a better understanding of the content and ideas conveyed.
- Discuss student answers briefly as a class.

Check for Understanding

Ask students to comment on what the text, the diagram, and the water cycle each add to their understanding of changes in state.

» Answers will vary but should reference the value of visual aids and real-life examples.

Lesson 3: Detectives and Scientists, Part 1

Writing

45M

Primary Focus: Students will appropriately organize information to track character information and development. **TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B**

ORGANIZATION OF CONTENT (15 MIN.)

Introduction

- Read aloud the beginning of Chapter 3 (up to "today there's a mystery to be solved") to introduce the mystery.
- You may wish to spend a couple of minutes discussing Amy's actions in looking at Kristal's drawings.

1. **Evaluative.** How does Kristal's sketch corroborate Dr. Forester's story that there were six fossils?
   » Kristal had drawn the fossils the day before, and she showed six different ones.

Organizing Character Maps

- Remind students that Amy wants to be a detective, not a scientist. Now it looks as though there might be a case. Tell students that they will be acting as detectives as well as scientists as they figure out if there is a mystery to be solved—and if so, the culprit!

2. **Evaluative.** What is the possible case?
   » whether a fossil was stolen

- Tell students that their first act as detectives is to track the characters (and possible suspects).
- Tell students that they need to organize the information so that they can easily track the information later and use it.

3. **Evaluative.** Why do detectives need to track the characters, and why do they need to think through how to organize their information?
   » Answers will vary but could include to look for clues, to understand the motive of characters, and to easily locate and use evidence later in the case.

TEKS 5.6.F Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters.

Support

Explain that *corroborate* means "support, or give evidence for, an idea." It is a word frequently used in detective investigations.

Support

Being *scrupulous* is being very careful about doing something correctly or honestly.

Challenge

Show only one character map sample, and allow students to brainstorm new forms of organization.

ENGLISH LANGUAGE LEARNERS

Writing
Understanding Text Structure

Beginning
Provide students with advantages and disadvantages for the four model character maps. Through discussion, help students choose one model for their maps.

Intermediate
Provide students with advantages and disadvantages for the first of the four model maps. Ask students to refer back to your previous discussion to suggest advantages/disadvantages for the others.

Advanced/Advanced High
Ask students to refer back to your previous discussion and provide advantages for their choice.

ELPS 3.G

Activity Page 3.3

- Tell students that, as detectives, they have to be scrupulous about when they are recording factual information and when they are making inferences about the characters. While the inferences are important in analyzing characters (or suspects), they wouldn't be accepted by a police officer or judge.
- Remind students that they are tracking characters as a precaution—we don't know yet if there's been a crime.
- Using a Think-Aloud activity, discuss the four sample character maps for Matt you displayed earlier. In the first three cases, discuss with the class why you might organize your character map this way and its advantages and disadvantages.
- Make clear to students that not everything has been copied from the text. For example, there are many quotes from the text that make it clear that Matt likes the idea of fossil camp, but this does not need to be listed several times under each category.

Check for Understanding

For the last character map (continuous prose), ask students to name some advantages and disadvantages of this organization.

CREATION OF CHARACTER MAPS (20 MIN.)

- In the same small groups as the previous activities, ask students to complete character maps for Amy.
- Ask students to begin by deciding how they will organize their character maps: using either one of the four samples or a new method. Ask volunteers for reasons for their decisions, and discuss these as a class.
- Now ask students to complete their character map. As students work, circulate and check in.
- When students have finished, review their answers as a class.
- Ask students to continue completing their character maps for the remaining characters. Ask different members of groups to choose different characters so that one completes for Julian and Daria while another completes Felix and Kristal, respectively. They should complete their maps at home. (These will be built upon in Lesson 6, so completing them is important.)
- Direct students to Activity Page 3.3.

Character Map 1

Matt

Character Traits and Observations

- Makes friends easily
- Loves chemistry and palentology

Says and Does

- Drives to camp withTess and Amy
- Excavates dinosaur with Amy

Relationship with Other Characters

- Amy's brother
- Talked Amy into going to fossil camp

Motivations/Wants

- Wants to go to Fossil Camp
- Wants to make an important discovery

Character Map 2

	What He Says or Does	What We Learn About His 'Wants'	What We Learn About His Character	What Else We Learn
Chapter 1	• Drives to fossil camp • Arrives at camp and joins everyone in lab	• Wants to be at fossil camp • Wants to make an important discovery	• Makes friends easily • Doesnt mind heat/bugs dirt	• Amy's brother • He talked Amy and parents into going to fossil camp • Thinks camp is 'cool'
Chapter 2	• Excavates jawbone with Amy • Does dishes later that eveningv			• Asks 'excellent question' about chemistry
Chapter 3				

Support

Help students choose how to organize and select before they begin to ensure they are categorizing information in a helpful way.

Challenge

Assign characters to individual students and call them up to "interview" them on their character and their wants.

Character Map 3

Tess
- Asks 'excellent' questions

Amy(Matt's sister)
- Persuades to go to fossil camp
- Excavates dinosaur with

Matt
- Makes friends easily
- Doesn't mind heat/bugs/dirt

Fossil Camp
- Thinks 'cool'
- Does the dishes

Julian
- Both want to make important discovery
- Shares tent with

Felix
- Shares tent with

Character Map 4

Matt

Matt is Amy's brother. He persuaded Amy to go to fossil camp and his parents to allow them to go. He hopes to make an important discovery. He makes friends easily and doesn't mind heat, dirt, or bugs. He thinks the camp is "cool." He has a "glow of excitement" about going to the dig site.

At the dig site, Matt excavates a jawbone with Amy. When they take a break, he asks 'excellent' questions of Tess about states of matter. Later that night he does the dishes.

DISCUSSION (10 MIN.)

- Remind students that, in the first two lessons and for the first half of today's lesson, they concentrated on the scientific content in *The Badlands Sleuth* and how it was presented.
- Today, for the first time, they were introduced to the possibility of a detective mystery.
- Tell students that for the rest of the unit they will be playing two roles—detective and scientist.
- Tell students that, to do this successfully, they need to analyze text from both perspectives: detective and scientist. Just as they considered how to present information differently, they will now think about how to read different kinds of information and analyze it differently.
- Ask students to turn to Activity Page 3.4. Ask half of the class to read "Tess's Rules for Observation" and the remaining half to read "Inspector Ellis's Rules for Detection."
- Facilitate a class discussion on the similarities and differences between the two modes. First ask someone from the "scientist" half to read one of the sentences from Tess's rules. Then ask someone from the "detective" side to comment on a similarity or difference with one of their rules. Then swap sides.

Check for Understanding

Ask students whether they believe reading like a scientist and reading like a detective are fundamentally similar or fundamentally different. Ask for reasons.

End Lesson

Activity Page 3.4

Support

Remind students that one difference between scientists and detectives is the *kind* of content they're reading. Contrast the differences in content with the differences/similarities with the *way* in which the text is read.

LESSON

4

Finding Evidence

PRIMARY FOCUS OF LESSON

Reading

Students will use information from different sources to classify objects as metals or nonmetals. **TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.6.H**

Grammar

Students will understand how to reduce and combine sentences. **TEKS 5.11.C ; TEKS 5.11.D.viii**

Writing

Using a graphic organizer, students will summarize information from the Reader. **TEKS 5.7.D; TEKS 5.7.E**

FORMATIVE ASSESSMENT

Activity Page 4.2	**Categorizing Information Using Textual Evidence Part 1; Part 2; Part 3** Use information from a range of sources to assign elements to the right category. **TEKS 5.6.F; TEKS 5.6.H**
Activity Page 4.3	**Combine Sentences** Reduce and combine sentences for meaning, interest, and style. **TEKS 5.11.C**
Activity Page 4.4	**Summarizing Events** Summarize events in the Reader using a graphic organizer. **TEKS 5.7.D; TEKS 5.7.E**

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.11.C** Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity; **TEKS 5.11.D.viii** Edit drafts using standard English conventions, including subordinating conjunctions to form complex sentences; **TEKS 5.7.D** Retell, paraphrase, or summarize texts in ways that maintain meaning and logical order; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (45 min.)			
Partner Read: Chapter 3	Partners	20 min.	❏ The Periodic Table of the Elements (Digital Components) ❏ Activity Page 4.1, 4.2
Word Work: *Elementary, My Dear Watson*	Whole Group	5 min.	
Categorizing Evidence	Small Group	20 min.	
Language (15 min.)			
Grammar	Whole Group	15 min.	❏ Sample Sentences for Combining and Reducing (Digital Components) ❏ Practice Sentences for Combining and Reducing (Digital Components) ❏ Activity Page 4.3
Reading/Writing (30 min.)			
Summarizing Events	Partners	30 min.	❏ Activity Page 4.4

ADVANCE PREPARATION

Reading

- You may wish to extend this activity with the use of materials in the classroom, or by creating more examples for students to identify as metals or nonmetals.
- Display the Periodic Table poster found in the Teacher Resources section of this Teacher Guide. Alternatively, access digital versions of these in the digital components for this unit.

Grammar

- Write the following sentences on the board/chart paper. Alternatively, access digital versions of these in the digital components for this unit.

Combining

1a. The badlands were dry. Dust puffed up where they walked.

1b. The badlands were dry and dust puffed up where they walked.

2a. Amy didn't like sleeping by the door. Snakes were nearby.

2b. Amy didn't like sleeping by the door because snakes were nearby.

Reducing

1a. Amy, who was bored, wandered over to the rock, which was striped, and stared at it.

1b. Amy was bored and wandered over to stare at the striped rock.

2a. Amy liked books that involved mysteries more than romance, or science, or any other kind of genre.

2b. Amy's favorite books involved mysteries.

Writing

- This lesson contains a Think-Aloud activity. During a Think-Aloud, make your thinking visible to students by modeling the steps to solving a problem or completing a task. As you "think aloud" while working through an activity students observe your approach to finding information, drawing conclusions, considering questions, and testing ideas.

Universal Access

- For grammar, help students identify appropriate conjunctions by explaining their purpose (for example, we use *and* for adding information, or for giving alternatives, *but* for unexpected information, etc.)

ACADEMIC VOCABULARY

classify, v. arrange into categories according to a definition

element, n. essential part of something

Start Lesson

Lesson 4: Finding Evidence

Reading

45M

Primary Focus: Students will use information from different sources to classify objects as metals or nonmetals. **TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.6.H**

PARTNER READ: CHAPTER 3 (20 MIN.)

Introduce the Chapter

- Ensure that each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 3.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

slather, v. spread on thickly

furnace, n. a very hot oven

plateau, n. an area of high, level (no slope) ground

atom, n. the basic unit of an element

Periodic Table, n. a way of organizing chemical elements

resonance, n. a quality of sound: clear, deep, long lasting

conductor, n a good channel for something (like electricity)

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.6.H** Synthesize information to create new understanding.

Vocabulary Chart for Chapter 3, "A Fossil Goes Missing"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	plateau atom Periodic Table	slather furnace resonance
Multiple-Meaning Core Vocabulary Words	conductor	
Sayings and Phrases		

Activity Page 4.1

Read "A Fossil Goes Missing"

- Ask students to read the chapter in pairs. As with previous units, you may pair students in a number of ways. They will read up to "All the known elements are arranged on something called the Periodic Table of the Elements" on page 18 of the Reader.
- Explain that both students will read the first page silently, and then one partner will read that page aloud. Next, they will both read the second page silently, and then the other partner will read that page aloud, and so on. Students can ask their partner for help with sounding out or defining words as necessary.
- As they read, ask students to complete the questions in Activity Page 4.1. One of each pair should complete the detective questions, and one should complete the science questions. Students should then explain their questions and answers to their partner.

Support

When completing the detective questions, ask students (1) What are we told is happening? (2) Are there any other details we are given? (3) What evidence does this give us?

Support

Indicate means "suggest."

Challenge

Is this a similar introduction to previous scientific content in this Reader?

» Students should be able to identify a consistent thread of questions from campers leading to explanations from Tess.

Check for Understanding

Ask students to identify how the author introduced chemical content in this chapter.

» Answers will vary, but through class discussion should include (1) Julian asking a question, and (2) the question arose from the activity that the campers were engaged in (excavating rock).

Chapter 3

A Fossil Goes Missing

THE BIG QUESTION
How do we keep track of all the elements?

"Dr. Forester doesn't look very happy this morning," said Felix as he poured milk on his instant oatmeal and passed the carton to Amy. She followed Felix's gaze. Dr. Forester was standing outside the lab with Tess, gesturing and shaking her head.

Matt **slathered** butter on a piece of toast. Julian had made himself a peanut butter sandwich, and Daria was munching an apple. The only one who wasn't eating was Kristal. Wearing her dark glasses, she silently sipped a cup of hot tea. Before breakfast, Kristal had been sitting on her cot, working on a sketch. When Amy had asked to see what she'd drawn, Kristal had pulled her sketchbook tight to her chest. Amy had wondered why Kristal would be so secretive about her drawings.

Dr. Forester finally came over, poured herself a mug of coffee, and joined them at the table. "One of the little fossils from the gully seems to be missing." She lifted the cup but set it down again without taking a swallow. "I could have sworn there were six fossils, but this morning there were just five on the table in the lab."

"Did you search the tent?" Julian asked.

Dr. Forester nodded. "And now Tess is searching again. The thing is, I could be mistaken about the number of fossils. There might have just been five to start with. Still, it's a bit of a mystery."

At the word *mystery,* Amy started to tingle all over. A missing fossil? Now *that* was something she could get interested in! Amy thought about Inspector Ellis and his notepad. She suddenly remembered she'd tucked a

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small notebook inside the front pocket of her backpack just before she and Matt had left home. It would be perfect for recording any clues she might uncover regarding the missing fossil.

“Excuse me,” she said, pushing her chair away from the table. “I need to get something from the tent, but I’ll be right back.”

Amy sprinted to the tent and retrieved the notebook from her backpack along with a mechanical pencil. As she turned to leave, she spotted Kristal’s sketchbook lying on her cot. Before Amy realized what she was doing, she opened the sketchbook and quickly flipped through the pages until she came to one full of detailed drawings of the little fossils from the gully. There were drawings of six different fossils, not five. So there *was* a fossil missing! Amy put Kristal’s sketchbook back where she had found it, and hurried back to join the others.

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On the drive out to the dig site, Amy clutched her notebook, lost in thought. How had the fossil gone missing? Had someone taken it? And why hadn't Kristal mentioned her drawings to Dr. Forester?

"You look better today, Sis," Matt said, interrupting the stream of questions running through Amy's head. "Yesterday you seemed pretty unhappy."

Amy smiled at her brother. '*Today is different,*' she thought. '*Today there's a mystery to be solved.*'

***

When they arrived at the dig site, Dr. Forester suggested they spend the morning continuing their excavations. After lunch, when the afternoon sun was turning the narrow plateau into a **furnace**, they'd scour the gully. "Maybe we'll be lucky and find more small fossil bones," she explained.

Amy noticed that this plan seemed to please everyone, especially Julian. He pulled out his pick and brush and set to work before anyone else. After a while, he paused and looked over at Tess. "Yesterday you were talking about how matter can change states. But what makes one kind of matter different from another? What makes this pick different from, say, the rock or the fossil bones?"

Tess rocked back on her heels, wiping the sweat from her brow. "Before I can explain that, we need to fill in a few background details. Remember when I said that matter was made up of small particles? Those particles are called atoms, which are so small they are invisible to the naked eye. There are more than a hundred different kinds of atoms, and each kind is called an element."

"But aren't **atoms** composed of even smaller particles called protons, neutrons, and electrons?" Daria asked.

"Indeed they are," Tess agreed, "but an atom is the smallest amount of any element that still has the properties of that element. Elements, then, are the basic substances that make up all matter—think of them as the basic ingredients of matter. All the known elements are arranged on something called the **Periodic Table** of the Elements."

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WORD WORK: ELEMENTARY, MY DEAR WATSON (5 MIN.)

- Tell students that scientific communication can be confusing because words that mean something different in everyday language have a very specific meaning to scientists.

1. **Literal.** Ask students to define from the text the word *element*.

    » The basic substance that makes up all matter. Different kinds of atoms are different elements.

- Tell students that there are different definitions of *element*. Read the following two phrases and ask students to guess what *element* means in each case:

    "Elementary, my dear Watson," said Sherlock Holmes, shaking his head at his friend's simplicity.

    » *Element* means the simplest ideas or principles of something.

    "I only just bought it, and the element in my toaster is already damaged!" wailed Max.

    » *Element* means a small part of an electrical device, containing a wire that conducts electricity.

2. Can you see any similarities between these definitions?

    » Answers will vary, but may understand that the definitions of *element* relate to it being a simple part of something. You may wish to tell students that similarly chemical elements often combine to form more complex substances.

- Remind students that when they inhabit their roles as scientists, they have to be very careful about the definitions of the words they use, because being precise is very important in scientific communication.

Activity Page 4.2

CATEGORIZING EVIDENCE (20 MIN.)

- Assign students to small groups.
- Ensure that the periodic table poster is displayed.
- Ask students to return to the Reader and use the information to complete the activity page.

Support

You may wish to support small groups by reading the descriptions aloud. Ask students to put their thumbs up whenever they hear something that is in the table they completed. Make sure they identify synonyms.

"We have one of those hanging on the wall of our science classroom this year," Kristal said.

"Excellent!" exclaimed Tess. "Then you may have noticed that each element has a name and a symbol made up of one or two letters. For example, oxygen is an element and its symbol is O. The element nitrogen's symbol is N, and the element aluminum's symbol is Al. The elements are arranged on the Periodic Table based on their properties and certain patterns in their atoms." Tess grabbed her rock hammer and held it up. "And that brings me back to your question, Julian. The elements are often divided into two basic groups: metals and nonmetals. The head of this hammer is mostly made up of the element iron." She flipped the hammer upside down. "The wooden handle is made up mostly of nonmetal elements, such as carbon, nitrogen, sulfur, and phosphorus."

Felix suddenly pulled out all his digging tools and arranged them in a line on the ground. "Ever notice how metal objects make a nice sound?" he asked with a mischievous look on his face. He began tapping his chisel against all the other metal objects, like he was playing the drums. Each one gave out a *clang* when he struck it.

"If paleontology doesn't work out for you, Felix, you might have a future as a musician," Matt joked. "Then again, maybe not."

Felix made a face at him.

"Felix is right, though," Tess broke in. "That ringing sound—scientists call it **resonance**—is a property of metals. Being shiny is another. So is being malleable and ductile, which means that you can hammer metals into shapes and stretch them out into long, thin wires. And, if you've ever seen the inside of electrical cord, you've probably noticed the metal wires inside. Another property of metals is that they are good **conductors** of electricity and heat."

Tess picked up a piece of sandstone and set it out on a flat space beside her. "Nonmetals, on the other hand, have very different properties. They tend to break or crumble, not bend." She hit the rock with her hammer and it shattered into pieces. "They also don't conduct electricity, they are usually dull rather than shiny, and they lack that lovely resonance." She tapped her hammer on her water bottle and it made a dull *thunk*.

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Evaluative. How are elements divided according to Tess?

» By metal and nonmetal

Support

You may wish to ask a member of the small group to answer one question each in part 3 of the activity.

Amy noticed that Dr. Forester had been listening to Tess, but she'd suddenly walked over to the far end of the plateau. Now she was returning—in a hurry.

"Change in plans, everybody," she said, breathlessly. "There's a storm coming." She turned and pointed toward the northwest, where a line of dark clouds hugged the **horizon**. Even as Amy watched, the clouds seemed to expand and move closer.

"I'm afraid it's moving directly toward us," Dr. Forester said, untying the lines that held the tarp over the dig site. "And when it hits, we don't want to be standing up here, exposed on this plateau."

"Why is that a problem?" Kristal asked.

Tess summed it up in one word. "Lightning."

Kristal's eyes grew wide. "So we're going to back camp, where we'll be safe in the tents?"

"Weren't you listening to the chemistry lesson?" Felix called out as he ran over to help Dr. Forester with the tarp. "The tents have metal poles, and metals conduct electricity."

"At home we go into the basement when a bad storm is coming," Daria said in a **tense** voice.

"And in a way," said Dr. Forester, stuffing the folded tarp into her backpack, "that's exactly what we are going to do. Everyone, grab your gear and follow me." She led them to the spot where Felix had slid down into the gully. The wind was blowing much harder, and the storm now covered half the sky like a huge, black curtain sweeping toward them.

"Yesterday when I was walking along the gully, I spotted a shallow cave near the end of this ridge." Dr. Forester had to shout to be heard above the rising wind. "Climb down carefully; it's slippery."

"You can say that again!" yelled Felix.

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Amy kept her eye on the storm as they hurried along the dry gully. Bright chains of lightning zigzagged through the steely gray clouds that were quickly approaching, and she could hear the deep rumble of thunder.

By the time they reached the cave, the storm had blotted out the sun. They scrambled up the rocky hillside and stepped beneath the cave's sheltering overhang just as the first raindrops began to fall.

"Move to the back," Dr. Forester shouted above the booming thunder. They huddled together in the deepest corner as the storm struck. Rain fell in great, swirling sheets. Bolts of lightning flashed and thunder crashed so loudly that Amy had to cover her ears.

Gradually, the rain began to let up. The rumble of thunder grew more and more distant as the storm slowly moved off. Dr. Forester stepped to the front of the cave and the others followed.

"Everything looks so much more colorful," Kristal said, as the sun came out,"like the rain washed it clean."

"It might have done a lot more than that," Dr. Forester mused. "Rain erodes these rocky ridges and loosens fossils hidden inside them. Sometimes," she paused and looked thoughtfully at the gully below, "it washes fossils down off the ridges into low spots."

Felix was the first to understand. "You mean—we might find more of those strange little fossil bones in the gully below the dig site?"

Dr. Forester gave a quick nod. "Exactly! So, if you all don't mind getting your boots a little muddy, let's go on a fossil hunt!"

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ENGLISH LANGUAGE LEARNERS

Language

Beginning
For combination, focus students on the second and third sentences. Offer students options as they combine sentences. For condensing, help students create single clause sentences.

Intermediate
For the first sentence in the combination exercise, help students discuss the appropriate word *while* and ask them to identify causality in the sentence.

Advanced/Advanced High
For combination, ask students to justify their choice of words by explaining the connection between sentences, including cause and effect.

ELPS 5.F

Support

Use alternative conjunctions and ask students to comment on how it changes meaning

Check for Understanding

Review the final answer (for sulfur) as a class. Students should be able to identify Sulfur as the element, and identify it as a non-malleable substance that does not resonate, and therefore as nonmetal.

Lesson 4: Finding Evidence

Language

15M

GRAMMAR (15 MIN.)

Primary Focus: Students will understand how to reduce and combine sentences.

TEKS 5.11.C; TEKS 5.11.D.viii

Model

- Remind students that they looked in Lesson 2 at expanding sentence by adding detail and description. Tell students that they will now look at combining and reducing sentences.
- Show students the sentences you prepared:
  - 1a. The badlands were dry. Dust puffed up where they walked.
  - 1b. The badlands were dry and dust puffed up where they walked.
  - 2a. Amy didn't like sleeping by the door. Snakes were nearby.
  - 2b. Amy didn't like sleeping by the door because snakes were nearby.
- Point out that in both cases, the sentences had been combined into a single sentence. Tell students that reading can get very boring if all sentences are the same length. Combining sentences also allows you to add meaning. For example, in the second sentence, adding the word *because* shows that the reason Amy didn't like sleeping by the door was directly related to the snakes nearby.

Check for Understanding

Ask students to identify the conjunction added in the first sentence

TEKS 5.11.C Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity; **TEKS 5.11.D.viii** Edit drafts using standard English conventions, including subordinating conjunctions to form complex sentences.

- Tell students that sometimes you want to combine and expand sentences, but sometimes you want to make sentences less complicated. Sometimes sentences are more powerful when they are short and punchy. Details can also sometimes get in the way of understanding, particularly with an informational text.
- Show students the second set of sentences you prepared:
  1a. Amy, who was bored, wandered over to the rock, which was striped, and stared at it.
  1b. Amy was bored and wandered over to stare at the striped rock.
  2a. Amy liked the books that involved mysteries more than romance, or science, or any other kind of genre.
  2b. Amy's favorite books involved mysteries.
- Point out that in both cases, the sentences convey the same meaning. However, the second sentence has been shortened to be more concise.

Practice

- Ask students to start Activity Page 4.3 and complete it at home.

Activity Pages 4.3 and 4.4

Lesson 4: Finding Evidence

Writing

30M

Primary Focus: Using a graphic organizer, students will summarize information from the Reader. **TEKS 5.7.D; TEKS 5.7.E**

SUMMARIZING EVENTS (30 MIN.)

Modeling Summarization

- Ask students to turn to Activity Page 4.4. Ask a student to read aloud the introduction to the Activity Page.
- Using the completed table as a guide, model summarizing the events in Chapter 1 (you may create an alternative organization if you prefer).
- On the board/chart paper, draw the table in the guide below. As you create the table, discuss with students the information you are taking from the Reader and how you are presenting it in the Reader (note form, *not* complete sentences.)

TEKS 5.7.D Retell, paraphrase, or summarize texts in ways that maintain meaning and logical order; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating.

Support

Ask students why it might be more difficult to use the information if it were written in continuous prose.

ENGLISH LANGUAGE LEARNERS

Reading
Understanding Text Structure

Beginning
Work with students as they complete their tables. Read the relevant text with them and ask them to first orally summarize the most important idea. Support them to turn this into note form.

Intermediate
Work with students as they complete their tables. Ask them to read the relevant paragraphs and then prompt them before they summarize. Review their notes.

Advanced/Advanced High
Ask students to explain why they chose particular pieces of information.

ELPS 4.G; ELPS 4.I

- As you fill in the table for this part of the Reader, ask students to copy it into their activity books.
- Direct students to Activity Page 4.4.
- Ask students to offer ways in which the notes were organized:
    - » Answers will vary, but may include the use of headings, and the division between the characters, their location, additional details, and events. Spend a moment discussing why the information has been divided in this way, and how it maps to the purpose of the summary (to create a police report).

When	Who	Where	Description	Incidents?
Day 1 – on way to camp	*Matt, Amy, Tess*	*In car driving to camp*	*Hot environment: badlands of eastern Montana. Pot holes in road*	
		Arrive at campsite	*Cluster of tents in shadow of high, barren ridge*	*Met by other campers and Dr Forester*
Day 1 – at the camp	*Amy, Darla, Kristal*	*Move to tent*	*One tent. Amy in bed near the door.*	*(Kristal has notebook – relevant?)*
Day 1 – at the camp	*Everyone: Matt, Amy, Tess, Amy, Darla, Kristal, Felix, Julian, Dr Forester*	*Move to lab tent*	*Big canvas tent with awning outside. Inside is a long table with instruments, boxes, and small cloth bags*	*Introduced to fossils. Kristal sketches them.*
Day 1 – at the digsite	*Everyone*	*Move to dig site*		

Check for Understanding

Ask students to name a detail they noticed in summarizing that they didn't notice the first time they read the text.

Completing Summarization

- Ask students to work in pairs. One of each pair should complete the table for the first half of Chapter 2 (up to the return to the campsite) and the other complete the table for the remainder of the chapter.
- Remind students to read the text closely and identify different characters' movements. Tell students they may not have information in every box for every row.

Check for Understanding

Once students have finished, ask pairs round the class to read out events in sequence. In each case, ask students "Did you include those details? If not, what would you add?" Ask the rest of the class to amend or add to their notes as they listen.

End Lesson

ENGLISH LANGUAGE LEARNERS

Reading
Understanding Text Structure

Beginning
In preparation for the police report, work with students to turn their first note into a simple complete sentence. Compare with them the completed sentence with the original text.

Intermediate
In preparation for the police report, ask students to turn their first note into a complete sentence.

Advanced/Advanced High
In preparation for the police report, ask students to summarize their first notes as complete sentences. Ask them how the sentences link to form a coherent picture.

ELPS 4.G

Support

Choose one or more pairs to work with as they complete their tables.

LESSON

5

Call in the Sheriff?

PRIMARY FOCUS OF LESSON

Writing

Students will organize and create a police report, which they will then revise in response to peer feedback. **TEKS 5.11.C; TEKS 5.12.B**

Speaking and Listening

Using evidence from multiple sources, students will debate whether the sheriff should investigate the missing fossil.

TEKS 5.1.C; TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.13.C

FORMATIVE ASSESSMENT

Activity Page 5.1	**Police Report** Report on events in the text, with notes for revision from peer feedback. **TEKS 5.11.C; TEKS 5.12.B**
Activity Page 5.4	**Debate on the Sheriff** Rubric to judge class debate. **TEKS 5.1.C; TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.13.C**

TEKS 5.11.C Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft; **TEKS 5.1.C** Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.9.E.ii** Recognize characteristics and structures of argumentative text by: explaining how the author has used facts for or against an argument; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

LESSON AT A GLANCE

	Grouping	Time	Materials
Writing (45 min.)			
Create Police Report	Individual	25 min.	❏ *The Badlands Sleuth* ❏ Activity Page 5.1 ❏ Sample Police Reports (Digital Components) ❏ Articles on Investigations (Digital Components)
Peer Feedback and Revision	Pairs	20 min.	
Speaking and Listening (45 min.)			
Prepare Arguments for Debate	Pairs	25 min.	❏ Activity Pages 5.2, 5.3, 5.4
Hold Debate	Small Group	20 min.	

ADVANCE PREPARATION

- In this lesson students will integrate information from multiple sources, as they did in Lessons 3 and 4. You may wish to collect student activity books at the end of class and review student work in these activities to prepare for tomorrow's lesson.

Writing

- There are two sample police reports found in the Teacher Resources section of this Teacher Guide. Alternatively, you can access digital versions in the digital components for this unit. Place copies of the two sample reports around the room so students can use them as examples and guides. There should be enough copies for students to comfortably read them. If you prefer, prepare copies and place them on students' desks.
- You may wish to organize partners so that peer feedback will be collaborative and supportive.
- You may create your own sample police report to model peer feedback.
- You may have students write a second draft of their report at home.

Speaking and Listening

- You may wish to review with students the rules for debate, including the use of opening statements.
- There is a rubric for students to use during the debate. You may use this rubric to assess selected students as they conduct their debates.
- The articles students read can be found in the Teacher Resources for this unit. Alternatively, you can access a digital version in the digital components for this unit.

Universal Access

- Provide models of how the sample police reports could have been converted from notes to summary form, for example:
    - "Fingerprints on counter" to "We found fingerprints on the counter of the grocery store."

- Provide students with written support to help them receive and give feedback with their peers:
    - "I thought that the point you made here was very interesting, and/however ______."
    - "Although I understood what had happened, I was less clear when you described ______. Perhaps we could work together to summarize the events?
    - "This seemed an important piece of information and it might be possible to make it more concise by ______."
    - "I wasn't sure that this was an objective fact, because ______."
- As students create their own opening statements, provide them with small stickers or labels for them to place next to text they wish to refer to (in the Reader or the additional articles provided).
- Before students create their opening statements, work with select groups to identify links between the rubric and the statement they have chosen. For example:
    - "I have met the requirements in part 2 of the rubric by providing the following evidence from the text: ______."

ACADEMIC VOCABULARY

investigation, n. formal observation or study of something. For police, an investigation is done to find out whether a crime was committed and who committed it.

Start Lesson

Lesson 5: Call in the Sheriff?

Writing

45M

Primary Focus: Students will organize and create a police report, which they will then revise in response to peer feedback. **TEKS 5.11.C; TEKS 5.12.B**

Support

Prompt students by asking questions. Is there a difference in how the information is organized? How are headings, subheadings, and numbers used? Any difference in how *formal* the writing is? Why does that matter?

CREATE POLICE REPORT (25 MIN.)

Review Summaries

- Ask students to spend a few moments reviewing the summaries they completed in their pairs the previous day.
- Tell students that they will use the information in the summaries to complete a police report—a report of the possible crime. The report will be submitted to the sheriff who will decide if there is enough evidence to warrant an investigation.

Support

You may wish to ask students to choose one of the sample reports from around the room to model their writing.

1. **Evaluative.** What might the purpose of a police report be?
   - » Answers will vary but should include the need for it to be factual and accurate, to give all the most relevant details for the police to investigate, and to assess whether this is a crime that should be investigated or not.

Support

If you would like students to spend more time working on their police reports, omit the peer feedback part of this lesson.

Review Sample Police Reports

- Before they begin writing, ask students to spend a few moments looking at the sample police reports around the room. Tell them to discuss with their peers the differences and similarities between the reports.

Write a First Draft

Activity Pages 4.3 and 5.1

- Tell students they will now take the information they summarized in the previous lesson, found on Activity Page 4.3, and convert it into a written police report. They should decide how to organize their information.
- When they are ready they should turn to Activity Page 5.1 and begin writing.
- As students work, circulate and check in. Ask them why they are organizing their writing in a particular way, and what choices they made about information to include.

TEKS 5.11.C Revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft.

PEER FEEDBACK AND REVISION (20 MIN.)

Model Peer Feedback

- Tell students they will now strengthen their police reports by getting advice and feedback from their peers.
- Model this by asking for a volunteer to read their piece aloud to the class. (Or, read an example you created.) Praise the strengths of the work, focusing particularly on organization, concise summaries of events, using facts rather than opinions and evidence from the text. Model asking respectful questions of the volunteer and making concrete suggestions for revision.

Peer Feedback

- Ask students to return to their pairs from the previous lesson (when they completed the summaries). Ask students to either read or listen to the draft reports and offer feedback.
- Remind them to listen attentively and respectfully and offer constructive suggestions. Ask students to look at the guidance in their activity books for how to draft a report and for ideas on how to focus their feedback.
- After five minutes, ask students to swap roles. Before they swap, ask the recipient of the feedback to thank their partners and give an example of a helpful comment. When the other member of the pair has received feedback, repeat the exercise.

Check for Understanding

Ask students to volunteer a constructive suggestion their partner made.

Notes for Revision

- Ask students to write three notes below their draft about how they would revise and strengthen their work. Remind students their changes could be organizational or focus on the specific content.

Check for Understanding

Ask students to provide examples of revisions they wish to make.

ENGLISH LANGUAGE LEARNERS

Writing

Beginning
With 1:1 support, create simple sentences from the notes in the previous lesson. Point students to sentences in the model police reports that are good examples.

Intermediate
Create sentences from the previous lesson's notes. Have students identify a good model from the police reports they read. Challenge them to make their sentences more concise.

Advanced/Advanced High
Have students explain how they'll make their writing coherent. Ask them what they chose and why.

ELPS 5.F

Support

Model changes you would make to your work based on the peer feedback conversation you previously modeled.

Challenge

Ask students to identify an area of their draft that needs revision. Have them suggest two possible ways to revise this section, then consider which one is better. Have students give a reason for their choice.

Lesson 5: Call in the Sheriff?

Speaking and Listening

45M

Primary Focus: Using evidence from multiple sources, students will debate whether the sheriff should investigate the missing fossil.

TEKS 5.1.C; TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.13.C

PREPARE ARGUMENTS FOR DEBATE (25 MIN.)

Review Additional Resources

Activity Pages 5.2 and 5.3

- Remind students that in previous lessons they practiced using information from multiple sources to explain chemical content. Tell students that today they will use some of the same techniques in their work as detectives to answer this question: Should the sheriff investigate the missing fossil?
- Assign one of each pair to be a police officer who thinks the answer to the question is yes and wants to convince the sheriff to investigate. The other should be a police officer who thinks the answer to the question is no and wants to convince the sheriff *not* to investigate.
- Ask students to read the two articles on Activity Page 5.2. These articles can be found in the Teacher Resources for this unit.
- Ask students to evaluate each article for evidence either supporting investigation or supporting not investigating and determine which article's arguments support their answer to the question.

Support

Discuss the two articles. In the first article, ask students what decides whether a crime is investigated. Ask students if they think the "missing fossil" counts.

Check for Understanding

Ask students to compare the arguments of the two articles. Students should be able to identify that the first suggests you need a lot of evidence before acting, whereas the second suggests you should be investigating to "prevent" a possible crime.

Support

Ask students whether the second article is arguing for investigation before or after a crime is committed.

Prepare Opening Statement

- Ask students to complete Activity Page 5.3 with their answer to the question and the supporting evidence they gathered.

Support

Model an opening statement for each side of the debate.

TEKS 5.1.C Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.9.E.ii** Recognize characteristics and structures of argumentative text by: explaining how the author has used facts for or against an argument; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

HOLD DEBATE (20 MIN.)

- Assign students to small groups. In each small group, one student should play police officer 1 (for investigation) and another play police officer 2 (against investigation). The remaining members should play the sheriff. You can assign these roles or ask students to choose for themselves.
- Ask all students to read the rubric on Activity Page 5.4 before beginning their debate.
- Ask each police officer to make an opening statement.
- Now ask each police officer to respond to the other's opening statement and offer a reason why their opponent's argument is wrong. Remind them of the rules of respectful debate.
- As they debate, ask the students playing the sheriff to fill in the rubric in their Activity Book.
- Once the debate is concluded, ask the sheriffs to compare notes and declare a winner.

Check for Understanding

Take a poll of the winner–for investigation or against investigation. Ask groups to provide an effective argument their winner made. Ask students to identify which of the sources (the reader or the two articles, or both) the argument came from.

End Lesson

ENGLISH LANGUAGE LEARNERS

Speaking and Listening

Supporting Opinions

Beginning
Help students label evidence from the previous lesson and the articles they have written.

Intermediate
Help students explain how their opening statement maps to the rubric in their Activity Pages.

Advanced/Advanced High
Prompt students on how opening statement meets requirements of the rubric in their Activity Pages.

ELPS 3.G

Activity Page 5.4

Support

Pick one or two small groups to work with, helping students judge as sheriffs and fill in the rubrics appropriately.

LESSON

6

Scientists and Detectives, Part 2

PRIMARY FOCUS OF LESSON

Reading

Students will track character development.

TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B

Students will integrate multiple sources to explain compounds and elements.

TEKS 5.6.H; TEKS 5.7.C; TEKS 5.13.C

Grammar

Students will understand how to use commas in a range of contexts.

TEKS 5.11.D.x

Morphology

Students will understand how to use the root *mit/mis*. **TEKS 5.3.C**

FORMATIVE ASSESSMENT

Activity Page 3.3 — **Character Maps** Use character maps to track character development.
TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B

Activity Page 6.4 — **Integrate information** Use information from the Reader and other sources to correctly identify elements and compounds.
TEKS 5.6.H; TEKS 5.7.C; TEKS 5.13.C

Activity Page 6.5 — **Grammar** Use commas correctly. **TEKS 5.11.D.x**

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources; **TEKS 5.11.D.x** Edit drafts using standard English conventions, including: italics and underlining for titles and emphasis, and punctuation marks, including quotation marks in dialogue and commas in compound and complex sentences; **TEKS 5.3.C** Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (25 min.)			
Partner Read: Chapter 4	Partner	15 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 6.1, 3.3
Create Character Maps	Partner	10 min.	
Reading (35 min.)			
Analyze Chemical Content	Partner	10 min.	❏ Activity Pages 6.2, 6.3, 6.4, 4.2 ❏ Periodic table (Lesson 4 Digital Components/Teacher Resources)
Word Work: *Eureka*	Whole Group	5 min.	
Elements and Compounds	Partner	20 min.	
Language (30 min.)			
Grammar: Use of Commas	Whole Group	15 min.	❏ Activity Page 6.5
Morphology: Root *mis/mit*	Whole Group	15 min.	❏ Roots Poster (Digital Components)

ADVANCE PREPARATION

Reading

- This activity uses the character maps students created in Lesson 3. Students can locate these on Activity Page 3.3. You can locate the sample character maps used in the lesson in the Teacher Resources for Lesson 3.
- Each pair completes questions for Julian and Kristal respectively. Students will have already completed for either Julian or Kristal in Lesson 3, and should be given the same character again.
- Either in the lesson or at home, students should copy their partner's character maps for the other characters, to allow them to solve the mystery in later lessons.
- It is possible students will need more space for their character maps. There are blank pages in the back of the activity book for this purpose. Alternatively, you can give them blank worksheets.

Reading

- This activity continues to build on the skills practiced in Lessons 3 and 4. Students should be increasingly comfortable combining sources. You may wish to briefly review the activities in Lessons 3 and 4. If you have provided feedback on those activities, you may wish to review this feedback before beginning the activity in this lesson.
- This lesson contains a Think Aloud activity. During a Think Aloud, make your thinking visible to students by modeling the steps to solving a problem or completing a task. As you "think aloud" while working through an activity, students observe your approach to finding information, drawing conclusions, considering questions, and testing ideas.

Morphology

- Ensure the Roots Poster is displayed. You may access a digital version in the digital components for this unit.

Roots Poster

Roots

A root is the main element of a word that forms the base of its meaning. A prefix or suffix added to the root can change the meaning.

Universal Access

- Prepare excerpts of Chapter 4 that describe Julian and Kristal, to help students identify relevant information.
- Provide sentence starters to help students identify evidence for their character maps. For example:
    - "My first piece of information about Julian is this quote: ______."
- Provide sentence frames to help students justify use of evidence for their character maps. For example:
    - I have chosen this piece of information because in the text ______, which is relevant because ______."
- Provide multiple choice and sentence starters to help students identify the correct molecules:
    - This diagram has one/more than one element.
    - Because it has one/more than one element it is an element/compound.
    - I know this because the text says "compounds have ______."
- Provide sentence frames to help students formulate their answers:
    - The texts says the main difference between elements and compounds is ______, and therefore this diagram is a ______, because it shows ______.
    - Because this diagram is a ______ and has the elements ______, and because the description says that ______ has ______, I know that this diagram represents ______.
- In the Morphology segment, provide additional sentences on familiar and unfamiliar topics to help students decipher brainstormed words. Some examples are in the supports in the lesson.

Start Lesson

Lesson 6: Scientists and Detectives, Part 2

Reading

25M

Primary Focus: Students will track character development.

TEKS 5.2.A.v; TEKS 5.4; TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B

PARTNER READ: CHAPTER 4 (15 MIN.)

Introduce the Chapter

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 4.
- Have students turn to the table of contents, locate the chapter, and then turn to the first page of the chapter.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

prod, v. to poke someone or something

condense, v. to change from a gas to a liquid

eureka, interj. ancient Greek word meaning "I have found it!"

discovery, n. the act of finding something new or unexpected.

nudge, v. to gently touch or push

bond, v. an attraction between atoms that allows chemical substances to be formed

molecule, n. a group of atoms bonded together

precisely, adv. exactly; with complete accuracy

visible, adj. able to be seen

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.6.F** Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters.

Vocabulary Chart for Chapter 4, "Who's Hiding What?"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	eureka bond	prod nudge precisely visible
Multiple-Meaning Core Vocabulary Words	condense	discovery
Sayings and Phrases		

Analyze the Text "Who's Hiding What?"

- Ask students to read the first half of the chapter in pairs. As with previous units, you may pair students a number of ways. They will read up to "There's no evidence someone took it, and why would they?" on page 25 of the Reader.
- Explain that both students will read the first page silently, and then one partner will read that page aloud. Next they will both read the second page silently, and then the other partner will read that page aloud, and so on. Students can ask their partner for help with sounding out or defining words as necessary.
- As they read, ask students to complete the questions in Activity Page 6.1. One of each pair should complete the questions for Julian, and the other should complete the questions for Kristal. Students should then explain their questions and answers to their partner.
- If time allows, ask students to also complete the language challenge questions in their Activity Books and discuss answers as a class.

Support

Students may need support understanding Julian's disappointment. Point them to the relevant text in chapter 2 [e.g.] 'My dad's famous. He owns four restaurants in Dallas. And my brother is famous to… If we discover something new, I sure hope I'm the one to find it.'"

Support

A question on Julian is "Which character tells us about how Julian is feeling?" Discuss with the class that this is one character's perception (Amy's) of another (Julian), Make a distinction between this and objective scientific information imparted in the chapter.

Activity Page 6.1

Chapter 4

Who's Hiding What?

THE BIG QUESTION
What is the difference between gold and fool's gold?

"Let's all spread out," Dr. Forester suggested as they reached the stretch of the gully below the dig site. "Keep your eyes peeled for anything that looks like the small fossil bones we found yesterday."

Everyone fanned out across the width of the gully, and with heads bowed, began scanning the rocky ground. Daria picked up something, frowned, and dropped it again. Then she **prodded** the rocky soil with the tip of her finger. "Wow, everything is sure drying out quickly," she said. "What happened to all that rainwater?"

"Some of it soaked into the ground," Tess replied. "But some of it evaporated and changed to water vapor that has mixed with the air. Remember, though, that physical changes are reversible. High above the earth's surface, the air is much colder. When water vapor encounters cold air, it loses heat and **condenses**. It changes states from a gas back to a liquid, forming tiny droplets of liquid water. Those tiny droplets in the air form clouds. If the droplets are big enough, they'll fall back to earth as rain."

"You mean we might get another thunderstorm?" Kristal eyed the sky warily.

"It's possible, but I'm guessing it won't rain again for quite a while," Tess replied. "I think the excitement is over for today."

Just then, Julian let out a shout. "Don't be so sure, because I just found gold! **Eureka**!"

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Everyone rushed over to see the gleaming, dark, yellow rock that Julian held in the palm of his hand.

"I'm not only going to be famous," Julian said, triumphantly, "I'm going to be rich. Just look at the size of that nugget. My dad is going to be so proud of me!"

Dr. Forester examined Julian's find carefully. "Sorry to disappoint you, Julian. I'm afraid what you have there isn't gold but a very common type of rock called iron pyrite."

Julian's face fell. "You're absolutely sure?"

Tess laid a comforting hand on his shoulder. "You're not the first person to make that mistake, Julian. In fact, iron pyrite is often called fool's gold for that very reason."

Amy could tell Julian was very disappointed that his great discovery turned out to be nothing. He didn't say anything as he took the rock back from Tess and shoved it deep into his pocket.

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A few minutes later, Matt stopped and nudged something with the toe of his shoe. “Hey, what about these?” Everyone rushed over and watched as Dr. Forester knelt down and then picked three more fossils out of the gravel.

“Maybe these will help me figure out just what kind of animal we have,” she said excitedly.

“Can we get back to the dig site now?” Julian blurted out in a loud, impatient voice. It was clear he didn’t want to look for small fossils anymore.

“It *is* almost noon,” Tess acknowledged, “so let’s break for lunch.”

They climbed up the slope to the dig site and retreated to the far end of the plateau again to eat sandwiches and fruit. Amy made a point of sitting next to Kristal. She unwrapped her sandwich but then laid it aside as she leaned in to ask the question she’d wanted to ask all morning. “Why haven’t you shown Dr. Forester your drawings of the little fossils yet?” Amy whispered. “If you did, she’d know there really is one missing.”

Kristal’s eyes went wide with surprise. “How did you know about my drawings?”

“I admit I peeked at your sketchbook,” Amy confessed, “but you can’t keep this information quiet. You need to let Dr. Forester know.”

Kristal was silent for a while. “Okay, I promise I will, but only—only if there is no one else around. Otherwise, people will make fun of my drawings.”

“No, they won’t!” Amy gasped. “You draw really well.”

Kristal suddenly looked past Amy with a surprised look on her face. “Hey, your sandwich!”

Amy turned just in time to see a small animal with narrow stripes making off with part of her sandwich. “You little stinker,” she said, laughing as the animal disappeared into a crack in the rocks far above them.

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“Those little ground squirrels are all over these badlands,” said Tess, chuckling. “They are very good at stealing food. I’ve known them to make off with other small objects they think might be food, too.”

After lunch, they returned to excavating Achy-Breaky’s bones. Matt had already exposed three of the dinosaur’s fossil teeth. Amy was making much slower progress because her mind kept wandering back to the missing fossil bone.

“We’re never going to get this jawbone excavated if you keep staring off into space,” Matt said quietly, glancing up at his sister.

“I know, I know,” Amy said, hurriedly picking up her brush to sweep away the bits of rock dust she’d created. “But I can’t stop thinking about that missing bone.” She told him about Kristal’s drawings.

“Maybe Dr. Forester simply mislaid it,” Matt suggested, “like Dad does with his car keys all the time. There’s no evidence someone took it, and why would they?”

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Activity Page 3.3

ENGLISH LANGUAGE LEARNERS

Reading
Reading/Viewing Closely

Beginning
With 1:1 support, identify the quotes from the text that support answers to Activity Page 6.1, using excerpts as necessary. Use sentence starters as appropriate.

Intermediate
With finger sweeping, ask students to identify the quotes from the text that support answers to Activity Page 6.1. Use sentence frames as appropriate.

Advanced/Advanced High
Ask students to show the link between the information in their character maps and the text they identified to answer Activity Page 6.1. Prompt them when necessary.

ELPS 4.B; ELPS 4.G; ELPS 4.J

CREATE CHARACTER MAPS (10 MIN.)

- Ask students to return to the character maps they created in Lesson 3, on Activity Page 3.3.
- Ask students to use their analysis of Julian and Kristal to continue to fill in the character maps.
- As students work, circulate and check in.

Check for Understanding

Ask pairs to explain their maps to their partners so that both students can complete maps for both Julian and Kristal: listen to partner discussions and answers.

Lesson 6: Scientists and Detectives, Part 2

Reading

35M

Primary Focus: Students will integrate multiple sources to explain compounds and elements. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.13.C**

ANALYZE CHEMICAL CONTENT (10 MIN.)

- Ask students to return to the beginning of Chapter 4. Tell students they will now be switching from detectives to scientists—analyzing the chemical content in the chapter.
- Read aloud the two paragraphs from "Daria picked up something, frowned" to "they'll fall back to earth as rain."

1. **Evaluative.** What two reasons does Tess give for the earth's drying out so fast?
   - » 1. water sinking into the ground
   - » 2. water evaporating into the air

- Ask students to turn to Activity Page 6.2. In pairs, students should read the paragraphs from Chapter 4 on molecules and compounds before answering the corresponding questions.

Challenge

How does this information link with the water cycle you annotated in Lesson 3?

- » Students should link evaporation and the movement of water underground to parts of the cycle they annotated.

Activity Page 6.2

Support

Ask questions orally and facilitate class discussion.

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

Amy had to admit that Matt's question was a good one. She glanced around at the group. Everyone was hard at work—except Felix, who just at that moment took something out of his pocket and popped it into his mouth! Felix noticed Amy staring and swallowed hard, gulping down whatever it was. He cleared his throat and suddenly turned to Tess. "I was wondering, Tess, just what is the difference between gold and fool's gold?"

Amy thought Felix just asked the question to turn her attention away from him.

Tess didn't notice, though, and was happy to answer it. "Remember that atoms are the smallest particles of matter. The thing is, you don't find many atoms all by themselves in nature. Atoms typically join together, or **bond** into groups of two or more to form **molecules**. Some molecules are made up of atoms of just a single element. A lump of gold, for example, would be made up of many gold atoms bonded together.

"Most molecules, though, are combinations of two or more different elements. A molecule of iron pyrite, for example, has two atoms of the element sulfur bonded to an atom of the element iron. Molecules that contain atoms of two or more different elements are called compounds. Water is another example of a compound. A water molecule is made up of two atoms of the element hydrogen and one atom of the element oxygen."

"Is that why people sometimes call water *H-two-O*?" Daria asked.

"**Precisely**," Tess replied. "There are millions of molecules that are compounds, and you can find them everywhere and in everything. This sandstone rock we're scratching away is made of molecules that are compounds. So are these dinosaur fossils, and the tools we're using. Each one of you is a walking, talking collection of different compounds that make up your bones, muscles, nerves, and everything else in your bodies."

Dr. Forester suddenly spoke up. "Okay, here's a riddle: why are all compounds molecules, but all molecules are not compounds?"

"Because some molecules are made up of atoms of only one element!" Matt exclaimed proudly.

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“Exactly right,” Dr. Forester said.

Tess was about to continue her chemistry lesson, when Daria pointed at something off in the distance, “Sorry to interrupt, but I think someone’s coming.”

Far off in the distance a black SUV was slowly approaching, bumping along on a barely visible track that wound among the ridges.

“I thought no one lived out here,” Amy said.

“No one does,” Dr. Forester replied, “but maybe these people are lost.” She dug a pair of binoculars out of her backpack and trained them on the distant vehicle.

As they all watched, the vehicle stopped, then quickly turned around and headed back in the direction from which it had come.

“That was strange,” Julian said. “It’s like they suddenly saw us and turned around.”

Amy thought it was strange, too. What was even stranger, though, was the look Dr. Forester and Tess exchanged as the black SUV drove away.

Nothing else disturbed their work for the rest of the day, and Dr. Forester was very pleased with their progress. As the sun started to sink in the western sky, they packed up their gear and said good-bye to Achy-Breaky for another day. Back at camp, Tess grilled hamburgers over the open campfire and heated baked beans in a cast iron pot.

After dinner, Dr. Forester put them all to work in the lab, helping her measure the little fossils from the gully and use the balance to determine their mass. Amy kept giving Kristal encouraging looks, hoping she would show Dr. Forester her sketches, but Kristal just kept shaking her head.

“Can you tell what kind of animal it was yet?” Julian asked, as they were putting all the instruments away.

“Well, this is a part of a leg bone,” Dr. Forester said, pointing at one of the fossils. “And this one looks to be part of a vertebra, or a piece of the backbone. But I’m still not sure what we have. It’s never a good idea to jump to conclusions.”

And then it was time for bed. Amy caught up to Kristal as she was heading to the tent.

“I know, I know,” Kristal whispered. “I promise I’ll show my sketches to Dr. Forester tomorrow. I need to get my courage up.”

Kristal fell asleep within minutes, but Amy decided to read until Daria came in. She finished one chapter and then another, but Daria still hadn’t come. Amy peered out through the tent flap and looked around at the silent camp. Everyone else was asleep as nearly as she could tell. Amy sat on her cot and began to worry. What if something had happened to Daria? What if she’d been bitten by a snake? Just as Amy was about to tug on her sweatshirt and shoes and go in search of her, Daria came bouncing into the tent with a huge smile on her face.

“Where have you been?” Amy hissed. “I was starting to worry.”

“Um! Ah—I went for a long walk!” Daria whispered back, sounding strangely excited.

“In the dark?” Amy asked.

“Oh—um—I used the flashlight on my phone,” Daria said quickly. “Good night!” She spun on her heel and headed for her cot.

Amy lay awake, thinking about Daria’s strange behavior, Felix’s secretive snacking, and the odd look Tess and Dr. Forester exchanged when the black SUV appeared. Perhaps they were clues to the missing fossil. She pulled out her notebook and by the light of her flashlight, listed them one by one. No matter how many times she read through the list, however, she couldn’t make sense of any of them, and finally decided, like Dr. Forester had with the small fossils, that there wasn’t enough evidence to draw any conclusions. But from now on she was going to keep a closer eye on Daria—and Felix.

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WORD WORK: *EUREKA* (5 MIN.)

- Choose one of the following two Word Work activities. The first further expands on Latin and Greek roots. The second expands on the different meanings of words in scientific and other contexts.
- Word Work Activity 1: Remind students they previously looked at scientific words with Latin and Greek roots, and that this helps create a "universal language" for scientific communication.
- Tell students *eureka* is another Greek word used by scientists and inventors when they discover or understand something new. It means, "I have found it."
- Tell students that the ancient Greeks were great scientists, and one of the most famous—Archimedes—discovered how to use water to find the exact weight of a gold crown. He was so excited by his discovery—made in the bath—that he jumped out of the bath and ran down the street with no clothes on, shouting "Eureka!" at the top of his lungs.
- Word Work Activity 2: Remind students that sometimes terms have a precise meaning in science and another meaning in everyday English. Remind students they investigated the word *element*.

1. **Evaluative.** Tess uses the word *condenses*. In chemistry this means to turn from a gas into a liquid. We also use the word *condense* in our writing, when we wish to make it shorter by removing unnecessary words and details. Why do you think the same word is used for both meanings?
    - » When a gas turns into a liquid it takes up less space.

ELEMENTS AND COMPOUNDS (20 MIN.)

Summarizing Information from the Reader

- Tell students they are going to use information from the Reader and from diagrams to identify different elements and compounds.
- Tell students that before they do this they will summarize the content they have learned from the Reader.
- Ask students to return to the four paragraphs on Activity Page 6.2. Tell them they will summarize the first two paragraphs.

Support

Ask students to think about the differences in the diagrams showing a gas and a liquid.

Challenge

Ask students to reduce the second paragraph to two sentences.

- » "Molecules are more commonly made up atoms of more than one element. They are called *compounds*, and examples include iron pyrite and water."

Support

Continue to model the second and if necessary the third paragraph.

Activity Page 6.4

ENGLISH LANGUAGE LEARNERS

Reading
Reading/Viewing Closely

Beginning
Use a combination of multiple choice and sentence starters to help identify the correct molecules.

Intermediate
Use sentence frames to ask students to identify the main difference between elements and compounds in the text, and apply this to their diagrams.

Advanced/Advanced High
Ask students to link their identification of the molecule (a) to key words and phrases in the descriptions and (b) from this to evidence in the text.

ELPS 4.F; ELPS 4.J

Support

Review the subject of a sentence.

Challenge

Ask students to come up with their own sentences with introductory elements.

- Using a Think Aloud model, summarizing the first paragraph. Remind students that summarizing means using only the most important information. As you work, describe how you have selected parts of the text and made them as concise (or as condensed!) as possible. For example, explain that you have removed all of the following text because it does not contain chemical content: "He cleared his throat and suddenly turned to Tess. 'I was wondering, Tess, just what is the difference between gold and fool's gold?' Amy thought Felix just asked the question to turn her attention away from him. Tess didn't notice, though, and was happy to answer it."
- Ask students to copy your summary into their Activity Books as you work. An example is below.

"Atoms, the smallest particles of matter, are usually found as molecules. Molecules are groups of bonded atoms, sometimes of a single element."

- Ask students, in their pairs, to summarize the second and third paragraph.

Integrating Information

- Ask students to turn to Activity Page 6.4 and combine the information in the reader with the additional diagrams and clues there.

Check for Understanding

Ask students to volunteer their answers and point to the information in the text and in the clues that led to their answer.

Lesson 6: Scientists and Detectives, Part 2

Language

30M

GRAMMAR: USE OF COMMAS (15 MIN.)

Primary Focus: Students will understand how to use commas in a range of contexts. TEKS 5.11.D.x

- Tell students that they will be investigating different uses of commas. One way to use commas is to separate introductory elements from the rest of the sentence.

TEKS 5.11.D.x Edit drafts using standard English conventions, including: italics and underlining for titles and emphasis, and punctuation marks, including quotation marks in dialogue and commas in compound and complex sentences.

- Tell students that introductory elements are words that come before the subject of a sentence. Ask students to define the subject of a sentence.
- Write the sentence below.

  "Underneath the shifting sands the dinosaur waited to be discovered."
- Ask students to identify the subject of the sentence. (*the dinosaur*) Place a comma before *the dinosaur* to show the separation of an introductory element.
- Ask students to complete the practice sentences on Activity Page 6.5.

Activity Page 6.5

Check for Understanding

Ask students to explain why the following sentence needs no comma: *Amy was very excited about the day ahead*.

MORPHOLOGY: ROOT *MIS/MIT* (15 MIN.)

Primary Focus: Students will understand how to use the root *mit/mis*. **TEKS 5.3.C**

- Refer to the Roots Poster you displayed in the classroom and read with students.
- Tell students that they will study the root *mit/mis*. Explain the origin of *mit/mis* is Latin and that it means "to send."
- Write the root *mit/mis* and its meaning on the board/chart paper.
- Explain that prefixes and suffixes can be added to change the part of speech of the root.
- Read out the following two sentences from Chapter 4 of the reader. Ask students to raise their hands when they hear words with the root *mit/mis* (these have been bolded for you). Briefly discuss the meaning of each word. Write the word and its meaning on the board, and the sentences from the Reader.

  "Maybe Dr. Forester simply ***mislaid*** *it," Matt suggested, "like Dad does with his car keys all the time. There's no evidence someone took it, and why would they?"*

  "I ***admit*** *I peeked at your notebook," Amy shot back, "but you can't keep this information quiet. You need to let Dr. Forester know."*

Support

Review affixes.

TEKS 5.3.C Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

ENGLISH LANGUAGE LEARNERS

Language
Reading/Viewing Closely

Beginning
Provide additional sentences on familiar topics for the brainstormed words to allow students to decipher and apply the meaning.

Intermediate
Provide additional sentences on topics related to the Reader to allow students to decipher the meaning of brainstormed words.

Advanced/Advanced High
As necessary, give students additional examples of the words used in context.

ELPS 1.H; ELPS 4.F

Challenge

Ask students to infer why *missile* might have a root from the Latin meaning "to send."

- As a class, brainstorm words containing the root *mit/mis*. Write the words on the board. An example table is below.

Affixed Word	Meaning	Sentence
mislaid	lost something unintentionally	*"Maybe Dr. Forester simply **mislaid** it," Matt suggested, "like Dad does with his car keys all the time. There's no evidence someone took it, and why would they?"*
admit	allow to enter; confess to be true	*"I **admit** I peeked at your notebook," Amy shot back "but you can't keep this information quiet. You need to let Dr. Forester know."*
commit	promise something	
permit	allow something	
missile	an object thrown or projected at something	

Check for Understanding

Take a few minutes, as a class, to brainstorm words that can have *mis/mit* added to the end of them.

Check for Understanding

Ask students to provide sentences using the words in the table above. Students struggling should be placed in a small group for a quick re-teach.

End Lesson

LESSON

7

Solutions

PRIMARY FOCUS OF LESSON

Reading/Writing

Students will use textual evidence to distinguish between mixtures, solutions, and compounds and then organize their writing to allow others to make the same distinctions. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B**

Speaking and Listening

Students will report on fossil creation, summarizing and synthesizing a written text with other sources. **TEKS 5.1.C; TEKS 5.1.D; TEKS 5.6.H; TEKS 5.7.C; TEKS 5.13.C**

FORMATIVE ASSESSMENT

Activity Page 7.2	**Tess's Rules** Create rules to distinguish between mixtures, solutions, and compounds. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B**
Activity Page 7.4	**How Fossils Are Formed** Use a rubric for presentations. **TEKS 5.1.C; TEKS 5.7.C; TEKS 5.13.C**

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft; **TEKS 5.1.C** Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.1.D** Work collaboratively with others to develop a plan of shared responsibilities; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading/Writing (30 min.)			
Small Group: Chapter 5	Small Group	10 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 7.1, 7.2 ❏ Activity Page 6.4 (optional)
Create Tess's Rules	Independent	20 min.	
Speaking and Listening (60 min.)			
Identifying Steps	Whole Group	15 min.	❏ How Fossils Are Formed (Digital Components) ❏ Activity Pages 7.3, 7.4 ❏ Supplementary materials (optional) ❏ PowerPoint or other application for presentations (optional)
Find Supplementary Information	Small Group	15 min.	
Preparing Presentation	Small Group	15 min.	
Giving Presentation	Small Group	15 min.	

ADVANCE PREPARATION

Reading/Writing

- The writing activity asks students to combine their understanding of compounds from the previous lesson with the information on solutions and mixtures in Chapter 5. You may wish to review Activity Page 6.4 to ensure students understood the material in the previous lesson. If not, you should begin the lesson with a quick review of the content using Activity Page 6.4 to guide you.

Speaking and Listening

- This activity can be extended substantially through the following:
    - Ask students to include graphics and other multimedia components, and use programs such as PowerPoint to expand on their presentation.
    - From the school library, pull an additional resource on dinosaurs and fossils for students to integrate into their presentations.
    - Provide large pieces of cardboard for students to paste diagrams and create a flow chart to show the creation of fossils.
- Although a Speaking and Listening activity, be aware this continues to ask students to integrate information from diagrams and multiple sources.
- You may also wish to create an in-class or out-of-class opportunity for students to present more extensively.
- Prepare to display the diagram on fossil creation. This can be found in Teacher Resources or in the digital components for this unit. You should make sufficient copies of the diagram for students to use in their presentations if they and you wish.

Universal Access

- Provide text excerpts to help students identify relevant information on mixtures, compounds, and solutions.
- Provide students with sentence frames to help them generate yes/no questions for Tess's rules:
    - "Does it ______?"
    - "Can it ______?"
    - "When you ______, does it ______?"

- Make sure you have copies of the fossil diagram for students who require additional support. This can be used to provide a structure and visual aid for their presentation and a visual aid.

Academic Vocabulary

precise, adj. exact and accurate

distinguish, v. to recognize differences between ideas, things, or people

Start Lesson

Lesson 7: Solutions

Reading/Writing

30M

Primary Focus: Students will use textual evidence to distinguish between mixtures, solutions, and compounds and then organize their writing to allow others to make the same distinctions. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B**

SMALL GROUP: CHAPTER 5 (10 MIN.)

As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

horizon, n. where the earth seems to meet the sky

mixture, n. two or more substances that are combined without changing their chemical composition

dissolve, v. to turn into a solution

suspicious, adj. giving the impression of dishonest behavior

decompose, n. decay

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft.

Vocabulary Chart for Chapter 5, "Sketches and Secrets"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	mixture dissolve	suspicious decompose
Multiple-Meaning Core Vocabulary Words		
Sayings and Phrases		

Small Group Read Chapter 5, "Sketches and Secrets"

- Divide students into two small groups. Work with Small Group 1 as students complete the questions below. Ask Small Group 2 to complete the Activity Page in pairs as they read the text.
- Ask students to read from the beginning of Chapter 5, "Sketches and Secrets," to "Matt smiled and mussed Amy's hair. 'When you figure that one out, sis, let me know.'"

Activity Page 7.1

- Ask students to turn to Activity Page 7.1 and complete the questions.

Chapter 5

Sketches and Secrets

THE BIG QUESTION
What do the sea and sweet tea have in common?

The sun looked like an angry red ball on the horizon when Amy got up. It was going to be another scorching hot day.

Tess had put out boxes of different kinds of cereal on the table, along with fresh and dried fruits and nuts. Amy sprinkled a few blueberries on her wheat flakes.

"Could you pass those, please?" Felix asked. Amy did and then stared as Felix dumped a handful of blueberries on top of all the things he had already heaped onto his cereal: raisins, sliced bananas, almonds, dried cranberries, peanuts, grapes, and flakes of dried coconut.

Felix noticed Amy staring. "What?" he asked, looking down at his bowl. "I always do this with cereal. It makes it more interesting and better tasting, too." He began stirring all the ingredients together with his spoon.

Tess tried to hide her smile. "Well, all I can say is that is quite a **mixture** you've got going there, Felix, at least in the chemical sense of the word."

"What do you mean?" Matt asked.

"In chemistry," Tess replied, "a mixture is made from two or more substances that are physically mixed together but can still be separated."

"You mean that I could pick out all the raisins," Felix said, plucking a raisin from the bowl and popping it in his mouth, "and all the nuts and all the banana slices and cereal pieces and so forth."

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Tess nodded. "And no matter how much you stirred the—er—mixture in your cereal bowl, all the different types of matter wouldn't change. They would still have the same properties that they had before you mixed them together."

Kristal had added a spoonful of sugar to her tea and was stirring it in. "But mixing sugar into tea is different, right?"

"Not really," Tess said, "because what you are making there is a solution, which is actually a special type of mixture. Solutions are formed when one substance is mixed into another and **dissolves**. It might look like the sugar disappears, but it really just turns into particles so small you can't see them in the liquid."

"But if sweet tea is a mixture, you should be able to separate the tea from the sugar, and I don't see how you could do that," Matt said.

"Actually you could," Tess replied. "It wouldn't be as easy as picking raisins out of cereal. But if you let all the liquid evaporate, the sugar would be left behind as tiny crystals."

"That's like what happens when you go swimming in the ocean and don't rinse off afterwards," Daria added. "The seawater evaporates, leaving little crystals of salt on your skin."

"Seawater is a solution that has lots of things dissolved in it," Tess agreed, "but especially a lot of salt!"

"Here comes Dr. Forester," Julian said. Amy got the impression he had been waiting for her, and when she sat down, he asked again if she'd had any luck figuring out what kind of animal the small gully fossils had belonged to.

Dr. Forester shook her head, but she was smiling. "The more I look at those little bones, though, the more excited I become. One of the three new pieces we found yesterday was especially interesting. From its shape and texture, I am quite sure it's from a small dinosaur."

Amy shot a hard glance at Kristal, who started to shake her head but then nodded and coughed softly. "Um, Dr. Forester," she said, producing

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the sketchbook she'd been holding on her lap, "I wanted to show you some drawings I made of the first little bones found in the gully." She flipped open to the drawings Amy had seen, and turned the book around so Dr. Forester and everyone else could see.

"These are very professional!" Dr. Forester exclaimed. "Kristal, you've captured the details well!"

"Thanks," Kristal said, embarrassed but obviously pleased. "But I wanted you to see them for another reason. You and Felix found six fossils that first day, not five, and my drawings prove it."

Dr. Forester studied Kristal's sketches for a long moment. "So one of them *is* missing," she said softly. "I'm hoping it will turn up, but until it does, I'd like to use your drawings, Kristal, when I study the fossils tonight."

As they were packing up to head out to the dig site, Matt pulled Amy aside. "So, what do you think happened to the missing fossil? Have you uncovered any clues as to where it might be?"

"I really have no idea, at least not yet. But it's not the only odd thing that's happened around here." She told her brother about Daria being gone for such a long time the previous night.

"Hmmm," Matt mused, "that does sound a little **suspicious**. Something strange happened in our tent last night, too. Felix has a huge backpack that's absolutely stuffed. Last night I was scooting it under his cot to make more room in the tent and he said he didn't like anyone touching his things. And now this morning," Matt's voice fell to a whisper, "there's a lock on it. Who puts a lock on a backpack?"

"Someone with something to hide?" Amy arched one eyebrow. "But why would Felix steal a fossil?"

Matt smiled and mussed Amy's hair. "When you figure that one out, let me know."

It was day three of their paleontology adventure. Felix and Daria had removed nearly all the rock from around the cluster of backbones. Kristal and

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Activity Page 7.2

Support

You may need to facilitate class discussion for the last question to help students understand how sugar in a solution could be left as a solid when water evaporates.

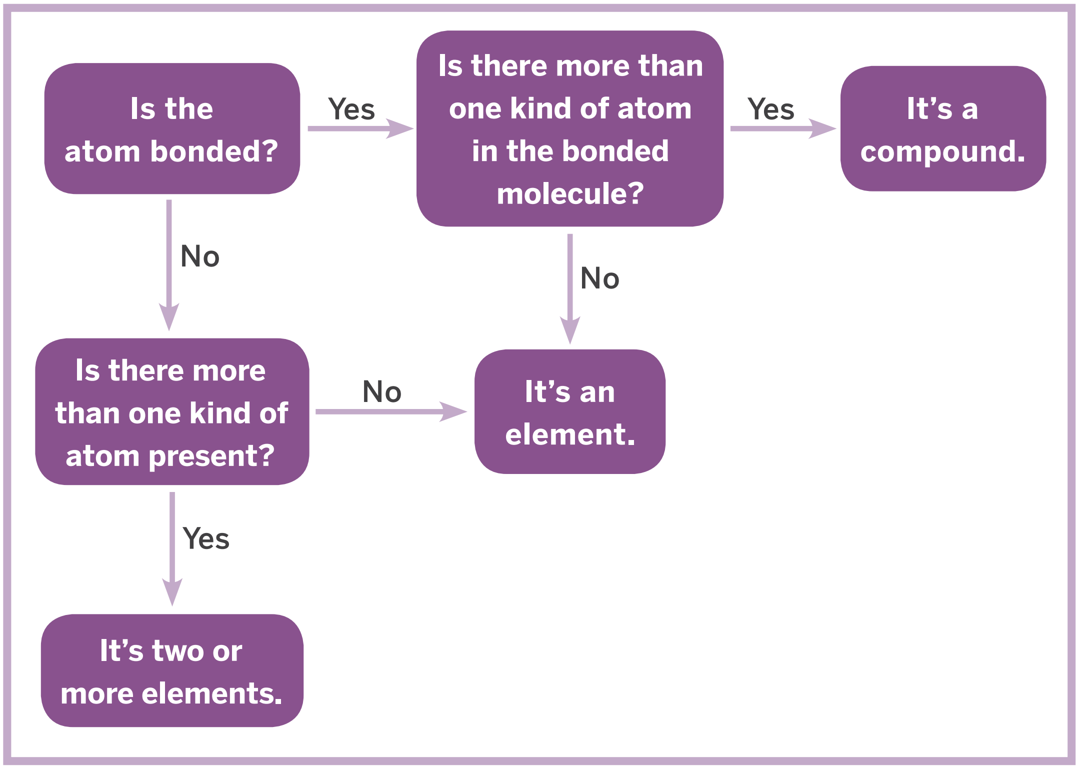
Challenge

Ask students to expand their final answers by referring to the states of sugar and water.

CREATE TESS'S RULES (20 MIN.)

Review Tess's rules

- Ask students to turn to Activity Page 7.2 and read the example of Tess's rules provided.
- Working as a class, use Tess's rules in the example to identify whether gold and water are compounds or elements. Tell students that gold is bonded to other gold atoms, and that the chemical composition of water is H_2O.
- Discuss with students how Tess's rules are organized. Read aloud the three bullets in the introduction to the rules. In each case, discuss with students whether her rules about compounds meet the criteria in the bullets:
    - Can people use this to answer the question (is something an element or a compound?)
    - Is it possible to decide the answer to the question I ask in each case?
    - Is it organized in a way that is easy to understand and use?
- Tell students that this organization is usually called a flow diagram and is used to answer multiple questions to decide on an outcome (in this case "do I have an element or a compound?").



Create Tess's Rules

- Ask students to return to Activity Page 7.2 to create "Tess's rules" for distinguishing between whether you have created a solution, a mixture or a compound. An example is provided as follows.

Check for Understanding

Ask students to evaluate whether the new flow diagram meets Tess's criteria (the three bullet points in the beginning of Activity Page 7.2).

Support

Create "Tess's Rules" together as a class.

ENGLISH LANGUAGE LEARNERS

Writing
Understanding Text Structure

Beginning
Model turning the sentence "They would still have the same properties . . ." into a yes/no question: "Does it still have the same properties as before?"

Intermediate
Provide students with sentence frames to help them generate yes/no questions (e.g., "Does it ____?").

Advanced/Advanced High
Discuss the difference between the way the text is presented in the Reader and the yes/no questions they are generating.

ELPS 5.F

Lesson 7: Solutions

Speaking and Listening

60M

Primary Focus: Students will report on fossil creation, summarizing and synthesizing a written text with other sources.

TEKS 5.1.C; TEKS 5.1.D; TEKS 5.6.H; TEKS 5.7.C; TEKS 5.13.C

- The instructions below assume that you have not supplemented with multimedia or software such as PowerPoint. Please adapt accordingly.

IDENTIFYING STEPS (15 MIN.)

- Ask students to return to Chapter 5 and resume reading (from "It was day 3 of their paleontology adventure").
- Work with Small Group 1 to help them gather information for their presentation and complete Activity Page 7.3. Divide the remaining students into groups of four and have them gather information for their presentations and complete Activity Page 7.3 together.

Challenge

Ask students to use the flow diagram to evaluate saltwater and sugar-water.

Activity Page 7.3

Check for Understanding

How did new compounds get to Achy Breaky when he was covered in sand that became rock?

» Water oozed through the rock and carried the compounds dissolved as a solution.

Support

Review the quotes that have been placed onto the diagram as examples:

- "His body was covered beneath a thick layer of muddy sand."
- "It was preserved for a long time, sealed beneath tons of sand."

TEKS 5.1.C Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.1.D** Work collaboratively with others to develop a plan of shared responsibilities; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

Julian were making good progress on excavating the bones of the dinosaur's foot. Amy could see that Matt would have the rock cleared away from his half of the jawbone by the end of the day. If she didn't work faster on her half, she'd be holding things up. Amy tried to put the mystery of the missing fossil out of her mind and concentrate on scraping and sweeping the crumbly rock away.

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As more and more of the dark, gleaming fossil was revealed, Amy remembered something Tess had said when they first arrived at Fossil Camp.

"Tess, remember when I asked you what a fossil was?"

"Ah, yes, so you did." Tess said, straightening up. "Now that you all understand a little chemistry, I'll give you a more complete answer."

Everyone put down their tools and stretched, happy for a break.

"Different kinds of fossils form in different ways," Tess began, "but these dinosaur fossils formed as the original compounds in Achy-Breaky's bones were replaced by other compounds, thanks to the powerful effects of a solution at work."

"Like sugar in tea?" Kristal asked.

"In a way," Tess replied. "When Achy-Breaky died millions of years ago, his body was quickly covered beneath a thick layer of muddy sand. As a result, it didn't break down, or **decompose**, in the way most dead things usually do. It was preserved for a long time, sealed beneath tons of sand that gradually turned to rock."

"As time passed, water oozed down through the rock and picked up different mineral compounds along the way. These compounds dissolved in the water, creating a solution. As more and more minerals dissolved in the water, they began to come out of the solution as solids again. Little by little, those mineral compounds settled in tiny spaces in Achy's bones and teeth. They replaced his original compounds so that what was left at the end of this process were fossilized bones and teeth. And that's what you are excavating right now."

"You sure were right, Tess," said Felix, "when you said that chemistry has a lot to do with paleontology."

Amy went back to work thinking about the fossils in the rock beneath her hands in a very different way. They weren't just old bones, but the result of amazing changes in matter that had taken place over an incredibly long period of time. They were pieces of ancient history, very real clues to the past. Thinking about fossils in this new way made Amy glad she'd let Matt talk her into coming to Fossil Camp. Even if she didn't solve the mystery of the missing fossil, she was glad they were here.

Hours later, they returned to camp, hot, sweaty, and tired. Tess warmed a big pot of water and set out a basin and towels. "Does anyone want to clean up before dinner?" she called out.

Amy was first in line. Tess poured some warm water into the basin and handed her a bar of soap. As she washed her face and arms, the water in the basin turned cloudy and light brown—the same color as the sandstone ridges. There was a layer of sandy grit at the bottom of the basin. "Wow, was I ever dirty," she said, patting her skin dry with the towel. Amy picked up the basin to toss away the dirty water and exclaimed, "I created a mixture, didn't I?" Tess nodded and laughed as she rinsed and refilled the basin for the next person in line.

After dinner, everyone gathered in the lab. Dr. Forester had laid out all eight of the fossil bones from the gully on a piece of cloth on the big table. "Tonight I want to show you how paleontologists help preserve fossils that are rather fragile, as these tiny bone fragments are." She held up a small brown glass bottle. "This is a special solution, a sort of glue called a consolidant, that we paint onto delicate fossils. Let me show you how it's done." A brush was built into the bottle's lid, and Dr. Forester used it to carefully apply a thin coat of consolidant onto each of the fossils. She explained that the consolidant soaked deep into the fossils, and as it dried and hardened, it would make them stronger and less likely to break.

"These will be dry by morning. Then I'll go back to work analyzing them. If I could just find a matching edge for even just two of them, I might have a large enough piece to say for sure what type of dinosaur this is." She sighed and screwed the lid back on the bottle. "We'll just have to wait and see."

34

FIND SUPPLEMENTARY INFORMATION (15 MIN.)

- Tell students that they will now treasure hunt for information to supplement their understanding of fossil creation. Tell them that they will use this information in a presentation about fossil creation that they will make with their small group.
- Tell students that they will gather information from previous chapters in the Reader, as well as information from an additional resource on fossils that you have pulled from the library. Remind them that they have been practicing integrating information from different sources, and that they have already started doing this by using the diagram in their Activity Books and adding information from the text. Now they will go a step further by integrating information from a new source as well.
- As a class, return to Activity Page 1.2 from Lesson 1. Point to the definition of *matter* ("anything that has mass or takes up space") and states ("matter can be in different states: solid, liquid or gas").
- Now ask students to turn to Activity Page 3.2. Point to the information about water changing state, and in particular point to water moving underground.

Evaluative. How does understanding that matter can move between different states help you understand fossil creation?

» "You need this to understand how the solution that trickles into Achy Breaky's bones can then have the liquid evaporate into gas to leave solid compounds forming a fossil."

- Ask students to turn to Activity Page 7.3 and, with guidance, complete the information from this text in the table.
- Ask students in their small groups to now look at the material from Chapter 4 and in their Activity Pages from Lesson 6 and use the information they learned to add information to help them understand fossil creation.
- Finally, ask students to use the information they learned about solutions earlier in the lesson to add information to help them understand fossil creation. An example of a completed table follows.

Lesson and Activity Page	What you learned	How it helps you understand fossil creation
1.2, 3.2	That matter can be in different states: liquid, solid, and gas.	When water evaporates from liquid to gas, it leaves behind compounds that become the Achy Breaky fossil. Water moves underground in the water cycle, then evaporates.
6.2	*Most atoms are found bonded to other atoms of different elements to create compounds.*	*The fossil is made up of compounds that replace the dinosaur bones.*
7.1	*Solids dissolve in liquids to form a solution of two compounds.*	*Water carry compounds in solution to Achy Breaky's bones, leading to fossil creation.*

Challenge

"You sure were right. . . when you said chemistry has a lot to do with paleontology." What does this mean?

» Answers should reference how chemical concepts have been used to explain the existence of fossils.

Activity Pages 1.2 and 3.2

Support

Continue to work with students to complete this activity, or continue to model as a class.

- Once students' tables are complete, introduce them to the new resource you brought from the library. Tell them they must integrate at least one piece of information from the source into their presentations.
- Read the source (or the most relevant part of the source) aloud to the class. Ask students to write down pieces of evidence that they could add to their presentations. Remind them that a presentation should include only the most important information.

PREPARING PRESENTATION (15 MIN.)

- Tell students to refer to their notes and Activity Page 7.3 as they prepare their presentations in their small groups.
- Remind them that a presentation gives the listener the most important information in the most engaging way. The purpose is to ensure the listener understands the material and is interested by it. Remind students they can use stories, examples, and other tools to keep the listener engaged. You may wish to model an example.
- Ask students to work in their small group to tell a story about the creation of a fossil. Tell them they may use the diagram of fossil creation you have prepared or create their own drawings to accompany the presentation.
- Ask students to spend five minutes brainstorming the order in which they wish to present their information and the *context* (the story) for their information. Ask students to decide which member of their group will present each part of the information.
- Ask students to look at the rubric in Activity Page 7.4 as they work to help them prepare.
- As students work, circulate and check in.

GIVING PRESENTATION (15 MIN.)

- Pair two small groups together. Ask groups to listen to each others' presentations and complete the rubric in Activity Page 7.4 as they listen.
- Remind students to listen carefully and respectfully.
- Choose a couple of presentations to attend.

Check for Understanding

Ask students to provide examples of ways in which the group they listened to engaged them in the material.

End Lesson

Support

Provide models of presentations to the class. Work intensively with one or two small groups as they prepare their presentations.

ENGLISH LANGUAGE LEARNERS

Speaking and Listening
Presenting

Beginning
Use the diagram in the Activity Book to help students structure a simple presentation, then help them add in information from the text for some of the steps.

Intermediate
Have students use the Activity Book diagram as a structure for the presentation, then place the additional information from their treasure hunt on it.

Advanced/Advanced High
Work with students to integrate presentation techniques such as storytelling into the structure provided by the Activity Book diagram.

ELPS 3.H

Activity Page 7.4

LESSON

8

Leaving Tracks?

PRIMARY FOCUS OF LESSON

Reading

Students will use explicit evidence from the text to track character development. **TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B**

Reading/Writing

Students will analyze how Amy's point of view influences character description, offering opinions on how this affects evidence of the character. **TEKS 5.6.G; TEKS 5.7.C; TEKS 5.12.C; TEKS 5.13.E**

FORMATIVE ASSESSMENT

Activity Page 3.3	**Character Maps** Use character maps to track character development. **TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B**
Activity Page 3.3	**Character Maps** Distinguish between fact and opinion in the character maps with asterisks/underlining. **TEKS 5.13.E**
Activity Page 8.2	**Opinion Writing on Character** Describe how the protagonist's point of view affects evidence on the character. **TEKS 5.6.G; TEKS 5.12.C**

TEKS 5.6.F Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters; **TEKS 5.6.G** Evaluate details read to determine key ideas; **TEKS 5.12.C** Compose argumentative texts, including opinion essays, using genre characteristics and craft; **TEKS 5.13.E** Demonstrate understanding of information gathered.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (55 min.)			
Close Reading: Chapter 6 Part 1	Whole Group	15 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 8.1, 3.3
Detective's Inferences	Partner	10 min.	
Create Character Maps	Small Group	30 min.	
Reading/Writing (35 min.)			
Reviewing Point of View	Whole Class	10 min.	❏ Activity Pages 3.3, 8.2
Identifying Opinions	Partner	25 min.	

ADVANCE PREPARATION

Reading

- **Note:** Only the first part of this chapter is read in this lesson.
- This activity uses the character maps students created in Lesson 3. Students can locate these in Activity Page 3.3. You can locate the sample character maps used in the lesson in the Teacher Resources for Lesson 3.
- By this lesson students should have filled in information for both Julian and Kristal from Lesson 6.
- It is possible students will need more space for their character maps. There are blank pages in the back of the activity book for this purpose. You can also give them blank worksheets.
- As written, this lesson contains peer review and revision. You may remove this if time does not allow.
- Between this lesson and Lesson 12, ensure students have an opportunity to copy other character maps for characters they did not focus on in this lesson.

Reading/Writing

- This lesson contains a Think Aloud activity.
- Write the following sentences on the board or chart paper:

  "He looked at me shiftily. I was sure he was up to no good."

  "The thief glanced both ways, snuck into the shop and took the trainer."

  "My puppy looked at me sadly, as though the food I was eating was the only thing that could save him from starvation."

  "She hurriedly put something back into her bag."
- Students will need to underline or asterisk their work. It may be helpful to provide them with colored pens or pencils.

Universal Access

- Prepare excerpts of the reader that describe the different characters to help students identify information.
- Provide sentence starters to help students identify evidence for their character maps.
    - “My first piece of information about Felix is this quote ______.”
- Provide sentence frames to help students justify use of evidence for their character maps.
    - “I have chosen this piece of information because in the text ______ which is relevant because ______.”
- For the writing segment, prompt students to identify subjective information.
    - Is the author only describing what happened or interpreting?
    - Is Amy describing feelings she has about the character? Is Amy describing feelings she thinks the character has? How do we know those are true?
    - Are there any actions Amy is describing? Can we be sure they are actions that occurred?
- Support students in constructing their answer to the writing prompt with outline structures.
    - “Amy made ______ assumptions about the character. They are ______, ______, and ______.
    - ______ matters because Amy assumed that ______ was ______ when we don’t know this is true. This could make us believe that ______ when we don’t know if this is the case.”

Start Lesson

Lesson 8: Leaving Tracks?

Reading

55M

Primary Focus: Use explicit evidence from the text to track character development.

TEKS 5.6.F; TEKS 5.7.C; TEKS 5.8.B

CLOSE READING: CHAPTER 6, PART 1 (15 MIN.)

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 6. They will read the first half only.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

tense, adj. nervous, tightly wound

flushed, adj. with a reddish color (usually the face)

genuinely, adv. honestly, authentically

incredulous, adj. disbelieving

unscrupulous, adj. not caring about the right thing to do

weaving, v. moving back and forth

slithering, v. sliding along

Vocabulary Chart for Chapter 6, "The Quest for Clues"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary		tense flushed genuinely incredulous unscrupulous slithering
Multiple-Meaning Core Vocabulary Words		weaving
Sayings and Phrases		

TEKS 5.6.F Make inferences and use evidence to support understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters.

Chapter 6

The Quest for Clues

THE BIG QUESTION
What are chemical reactions?

When Amy arrived at the breakfast table the next morning, it was obvious that something was wrong. Tess and Dr. Forester both looked tense, and no one at the breakfast table was talking. For once, even Felix was quiet.

Amy slipped into the chair beside Matt and asked softly, "What's going on?"

"Not sure," Matt whispered back. "They said they have something important to tell us but wanted to wait until everyone was here."

Julian was still missing. They all waited in silence until he finally came running up, **flushed** and breathless. "Sorry," he said, taking the last chair, "I overslept."

Dr. Forester clasped her hands on the table in front of her. "I'm afraid that Tess and I have some disturbing news. This morning when I went into the lab to see if the consolidant I applied to the gully fossils last night was dry, I discovered that they were gone."

"Gone?" Amy exclaimed, her heart suddenly pounding.

"All of them?" Felix asked, wide-eyed.

"Yes, every single one. We've looked everywhere, of course, but haven't found any **trace** of them. I can only conclude that someone took them during the night." She paused, and looked hard at each person at the table, one by one. "Did any of you see or hear anything strange last night?"

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Close Read: Chapter 6, Part 1

- Ask students to turn to Chapter 6 in their readers up to "'Well,' Amy said, watching him closely, 'it's a good thing you did.'"

Amy shook her head and shot a glance at her fellow campers. They all seemed **genuinely** upset and denied seeing or hearing anything other than the rhythmic creaking sounds of crickets and the soft sigh of the wind.

"Then I can only conclude," Dr. Forester said with a heavy sigh, "we were the victims of very clever fossil thieves."

"People steal fossils?" Matt was **incredulous**. "Who'd want to make off with dinosaur bones?"

"Oh, you'd be surprised," Dr. Forester said grimly. "Fossil hunters supply museums and private collectors all over the world. Most are honest people who obey the laws about where and how they can collect fossils. But unfortunately there are also some unscrupulous characters who dig up fossils on protected land without permission, or"— she paused—"steal them from paleontologists' dig sites."

"Since none of us heard anything," Dr. Forester continued, "I'm guessing the thieves parked their vehicle some distance from camp and then slipped in and out of camp on foot."

"That SUV we saw yesterday," Felix mused. "That was pretty suspicious. Do you suppose the thieves were in the SUV? Maybe they were spying on us?"

Dr. Forester shrugged. "It's possible, Felix, but it's just as likely that what we saw was nothing more than a car turning around."

"What if the thieves come back?" Daria asked, nervously.

For the first time that morning, Dr. Forester smiled. "That is the good news. I doubt very much that they will because they took the only fossils we have here at camp right now. I can't imagine they'll return."

"Shouldn't we call the police or something?" Matt asked.

"Well, there aren't really police out here," Tess said, "at least not like there are in a city. But Dr. Forester and I are discussing what to do."

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Inferential. From the text, can you use context clues to determine the meaning of the word unscrupulous?

» Students should be able to identify that unscrupulous people do things they shouldn't. Tell students that unscrupulous people are those who do not care about the right thing to do.

Tess served eggs and bacon, which put everyone in a better mood. But while the other campers chatted excitedly about fossil thieves and stolen bones, Amy was trying to think like Inspector Ellis. She guessed that the big thunderstorm that had washed the little fossils into the gully had also smoothed away any old tracks and footprints on the ground around camp. If fossil thieves had parked a vehicle nearby and walked into camp during the night, there should be clear sets of new tire tracks and boot prints to be found. She added this possibility, followed by a question mark, to the list in her notebook.

Amy slipped out of camp while the others were busy making lunches and packing up the excavation gear. She circled the cluster of tents at a distance, scanning the ground in open areas and dry gullies wide enough for a vehicle to drive along. Wherever she looked, the sandy soil was rain-flattened and smooth. Except for tiny footprints she'd guessed were made by ground squirrels and rabbits, there were no signs that anyone had approached their camp from the outside the night before.

Finding no clues is a clue in itself, Amy thought.

Convinced she'd made a thorough search, Amy headed back to camp. She was **weaving** around several clumps of tall grass when someone suddenly shouted, "STOP!"

Amy froze as Julian appeared off to her left, hurrying toward her. "Don't take another step, Amy!" he called out. "Stay absolutely still!"

She was about to ask why when she saw the snake emerge from a big clump of grass not five feet ahead and start **slithering** toward her. Amy's mouth went dry, and cold sweat beaded her skin.

Out of the corner of her eye, Amy saw Julian pick up a rock the size of a baseball. "I'm going to toss this rock so it lands between you and the snake," he said worriedly. "Hopefully, the snake will go in the opposite direction and head away from you."

Hopefully? Amy thought, as her heart thumped harder.

37

Inferential. Amy's mouth went dry and cold sweat beaded her skin. What do these details tell you?

» Students should be able to identify these as physical reactions that show Amy is afraid. They should identify from earlier in the text that Amy is afraid of snakes.

"Are you ready?"

Amy wasn't sure she was, but she took a deep breath and said "Ready!" in a tight, squeaky voice.

Julian chucked the rock and it landed exactly where he'd said it would. The snake stopped, tensed, and then turned and wriggled away, leaving a thin, S-shaped track in the sand.

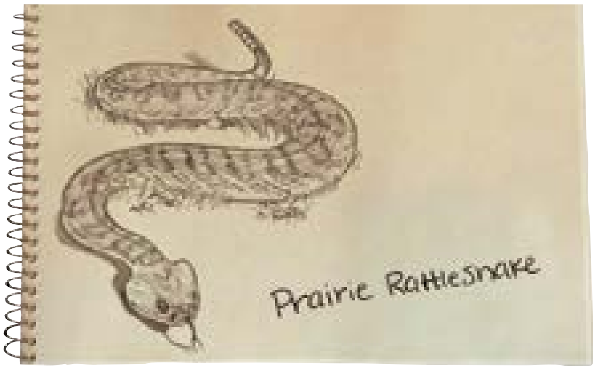
Amy's breath went out of her in a huge rush as Julian came running up. "That was too close," she said in a hoarse voice. "If you hadn't stopped me right then—anyway, thanks."

"You're welcome." He looked around and then back at Amy. "What are you doing way out here?"

"I was looking for tire tracks and footprints," Amy admitted, "to see if I could spot where the fossil thieves had parked their vehicle and where they'd walked into camp."

"Oh," Julian said, looking at her and then quickly glancing away. "Did you find any?"

Amy said she hadn't, and then something occurred to her. "So, Julian, what are you doing out here?"



38

"It was—it was getting time to leave and—I spotted you out here so I thought I'd come and get you." The words tumbled out of his mouth in a sudden rush.

"Well," Amy said, watching him closely, "it's a good thing you did."

***

"Where did you disappear to this morning?" Matt asked later that day, as he twirled his rock pick between his dusty hands.

"I was looking around the camp for evidence of fossil thieves," Amy murmured.

"What did you find?"

"Not a single boot or tire print, and that can only mean one thing."

"Which is—?" Matt looked at Amy questioningly.

She leaned closer and dropped her voice to a whisper. "That the thief is one of us!"

Just then, Tess clapped her hands to get their attention. "You're almost ready for the next stage of the excavation process, which is removing the bones you've exposed from the rocks beneath them. This morning, Dr. Forester and I are going to show you how that's done."

They gathered around Dr. Forester, where she knelt by the leg bone she and Tess had been excavating. "The challenge in removing fossil bones from the underlying rock is to make sure we collect them without breaking them. If we tried to **pry** or chisel them out from underneath, we'd almost certainly break them. Instead, we use a clever technique called trenching. Take a look," she said, gesturing to the leg bone.

"After the entire bone was exposed on top, we started carefully chipping away the rock all around, about six inches out from the fossil. We chiseled down for several inches—well below where we think the underside of the leg

39

Literal. How does Julian respond to Amy?

» Words "tumbled" out of his mouth.

Evaluative. What kind of literary device is this?

» Metaphor

Inferential. What does this detail indicate?

» Answers will vary but may include that Julian is nervous, or desperate to finish speaking.

Support

Review figurative language, including metaphors and similes.

Challenge

Ask students to come up with a simile to describe how Julian speaks.

DETECTIVE'S INFERENCES (10 MIN.)

Activity Page 8.1

- In pairs, ask students to turn to Activity Page 8.1 and complete the exercise from Inspector Ellis.
- As students work, circulate and check in.

Support

Model the exercise.

Challenge

Are there theories about the missing fossils that the lack of tracks does support?

» Answers will vary but could include a) someone internal taking the fossils and b) the squirrels taking them (students may point to the squirrels the previous day).

CREATE CHARACTER MAPS (30 MIN.)

Add New Suspects

Activity Page 3.3

- Ask students to turn to the character maps they have been filling in on Activity Page 3.3. Ask them to briefly review the maps for Julian, Kristal, Felix, and Darla and remind them they added information for Julian and Kristal in Lesson 6.
- Ask students if there are any suspects they would like to add character maps for. Through class discussion, students should identify the fossil thieves in the SUV and also the squirrels who stole Amy's lunch (and whose footprints are outside the camp) as possible suspects. Ask students to recreate the outline of their character maps, with the same organization as they used in Lesson 3, for those two new suspects.

Create Character Maps

- Divide students into small groups. Ask students to turn back to the beginning of Chapter 4 in their readers.
- Ask each member of the small group to take one of the following sets of characters: Julian *and* Kristal (both for one student), Felix *and* the squirrels, Darla *and* the SUV. Remind students that if they have been assigned Julian and Kristal, they have already found the information in Chapter 4 and added it to their character maps and should therefore begin at Chapter 5. Ask students to continue reading to "That the thief is one of us!"
- Ask students to read through the chapters in the reader and add relevant information for their characters. As students work, circulate and check in. Please see below for the points about each character for Chapters 4, 5, and 6 (or in the case of Julian and Kristal, Chapters 5 and 6). The way these points are represented depends on the students' organization of their character maps as you decided in Lesson 3. The asterisks represent opinions that will be explored in the final activity of this lesson.

Julian	Kristal	Felix	The Squirrels	Darla	The SUV
Seems to have been waiting for Dr. Forester and asks about the fossils. Late for breakfast: “overslept” Appears outside the camp and scares away the snake. Hurries to answer Amy when she asks why he is there.	Shows the bones drawings to Dr. Forester. Seems “embarrassed but pleased” when Dr. Forester praises them.	1. Popped something in his mouth and when Amy noticed, swallowed hard. Suddenly turns to Tess to ask question. Just to distract? Eats a lot of different cereals for breakfast Says he doesn’t like people touching his things then puts a lock on his backpack.	1. Steal food 2. Also steal other objects they think might be food 3. Tracks found near the campsite after the fossils disappear	Out late then bounces back smiling. Says she went for a long walk but sounds “strangely excited.” Says “quickly” she used a flashlight on her phone to walk in the dark.	Slowly approaches campers then seems to turn back when they see the campers. Felix wonders if they were thieves.

- Once students have finished, ask them to review their maps with their small group, giving other students the opportunity to ask questions, and add the information to their own maps.
- If time allows, combine two small groups and ask them to compare the content of their maps for the same character. Ask students to identify information that is different, or phrased differently, from their own maps.
- Give students a few moments to revise their maps in light of their discussions.

Check for Understanding

Ask students to name something useful they learned from a member of their small group (about a different character), or someone from a different group (about the same character).

Support

Work with one or two small groups as they complete their character maps.

ENGLISH LANGUAGE LEARNERS

Reading

Reading/Viewing Closely

Beginning
Students should only complete one character. With 1:1 support, identify quotes that give information for character maps. Provide excerpts as necessary.

Intermediate
With finger sweeping, ask students to identify the quotes from the text that support completing maps. Ask them to identify the key words and phrases that they should provide in their character maps.

Advanced/Advanced High
Ask students to show the link between the information in their character maps and the text they identified.

ELPS 4.B; ELPS 4.D

Lesson 8: Leaving Tracks?

Reading/Writing

35M

Primary Focus: Students will analyze how Amy's point of view influences character description, offering opinions on how this affects evidence of the character.

TEKS 5.6.G; TEKS 5.7.C; TEKS 5.12.C; TEKS 5.13.E

REVIEWING POINT OF VIEW (10 MIN.)

Support

Review the term *protagonist*

1. **Evaluative.** Who is the protagonist of the story?

   » Amy

2. **Evaluative.** Has the author described anything that happens when Amy is not there?

   » No. It is always in Amy's presence and through her eyes.

- Remind students that they must always distinguish between facts, or objective information, and opinion. If necessary, review the difference between fact and opinion with students.
- Review the sentences you wrote on the board/chart paper. In each case, ask the class to discuss whether the sentence reflects the protagonist's opinion, or fact.

Challenge

Ask students to come up with two sentences which describe the same action, one with only facts and one including opinions.

"He looked at me shiftily. I was sure he was up to no good"

» Opinion. You cannot know that someone is up to no good because of the way they look at you.

"The thief glanced both ways, snuck into the shop and took the tennis shoe"

» Fact. This describes actions that can be observed.

"My puppy looked at me sadly, as though the food I was eating was the only thing that could save him from starvation"

» Opinion. You cannot know how the puppy feels from his look.

"She hurriedly put something back into her bag"

» Both! Putting something in her bag is fact. "Hurriedly" could be opinion, since it implies she is moving too fast.

TEKS 5.6.G Evaluate details read to determine key ideas; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.C** Compose argumentative texts, including opinion essays, using genre characteristics and craft; **TEKS 5.13.E** Demonstrate understanding of information gathered.

IDENTIFYING OPINIONS (25 MIN.)

Finding Textual Evidence

- Ask students to return to the character maps they completed. With the same characters they worked on previously, ask them to underline or asterisk information they think represents Amy's opinion, rather than fact. Please refer to the previous answer key for possible answers.
- As students work, circulate and check in.
- Tell students they will use the work they have done on character maps today in future lessons as they try and figure out the mystery.

Opinion Piece on Amy's Point of View

- Ask students to turn to Activity Page 8.2 and complete the written prompt. Tell students that in the following lesson they will use this analysis to present to the Sheriff.

Check for Understanding

Ask students to point to an opinion they have asterisked or underlined for each of Julian, Felix, and Darla, and explain why it is opinion not fact.

End Lesson

Activity Page 8.2

ENGLISH LANGUAGE LEARNERS

Writing

Beginning
Write collaboratively with students. Identify information in their character maps and prompt whether this is objective or subjective. Work with students to turn the information into simple descriptive sentences about subjective evidence.

Intermediate
Ask students to place information in a table according to whether it is subjective or objective. Review and help them construct a paragraph describing the subjective evidence using outline structures.

Advanced/Advanced High
Ask students to construct a paragraph describing the subjective evidence.

ELPS 1.E; ELPS 5.G

Support

Work intensively with a few students as they write.

LESSON

9

Reactions

PRIMARY FOCUS OF THE LESSON

Speaking and Listening

Students will summarize the evidence on a character and offer opinions about its validity. **TEKS 5.1.A; TEKS 5.1.C; TEKS 5.6.H; TEKS 5.7.C**

Reading/Writing

Students will use textual evidence to distinguish between physical and chemical reactions and organize writing to allow others to make the same distinctions. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B**

FORMATIVE ASSESSMENT

Activity Page 9.2	**Presentation to Sheriff** Create rubric on presentation. **TEKS 5.1.C; TEKS 5.7.C**
Activity Page 9.4	**Tess's Rules** Create rules to distinguish between physical and chemical changes. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B**

TEKS 5.1.A Listen actively to interpret verbal and non-verbal messages, ask relevant questions, and make pertinent comments; **TEKS 5.1.C** Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft.

LESSON AT A GLANCE

	Grouping	Time	Materials
Speaking and Listening (45 min.)			
Preparing Presentation	Small Group	20 min.	❏ *The Badlands Sleuth* ❏ Presentation Rubric ❏ Activity Pages 9.1, 9.2
Giving Presentation	Small Group	20 min.	
Class Discussion	Whole Group	5 min.	
Reading/Writing (45 min.)			
Small Group: Chapter 6 Part 2	Small Group	25 min.	❏ Activity Pages 3.3, 8.2
Create Tess's Rules	Partner	20 min.	

ADVANCE PREPARATION

Speaking and Listening

- There are two ways that you can organize groups for this lesson:
  1. Students present on a set of characters individually, while students who assessed other characters evaluate the presentation in their rubric.
  2. Students who worked on a given set of characters (for example, Felix and the Squirrels) work together to prepare their presentations, then present to students working on a different set of characters.
- However you organize your groups, students should be in a position to listen to at least one presentation on the characters they did not prepare so they can fill in the rubric. If students need a lot of support, they can listen to other students present on the same character they prepared and only fill in the rubric for presentations on those characters. You may also wish to have one set of presentations from volunteers that the whole class watches and fills in the rubric for.
- You may also wish to add additional role playing elements (as you play the Sheriff). You could rearrange the class to look more like a sheriff's office, for example.
- The rubric students use can be found in the Teacher Resources section of this Teacher Guide. Alternatively, access digital versions of this in the digital components for this unit. You may wish to use the rubric to assess groups of students.

Reading/Writing

- The writing activity asks students to combine their understanding of physical changes from previous lessons with the information on chemical reactions in Chapter 6. You may wish to review the material at the beginning of the lesson, particularly if there are areas students seem to have struggled with. The table the class filled out in Lesson 1 may be helpful.
- In the course of this lesson, you create a table on board/chart paper through class discussion. You should keep this table displayed for the next lesson if possible.

Universal Access

- Provide the graphic organizer below to help students organize their presentations to the Sheriff.

My character is called ___				
Subjective Information	**My conclusion about the subjective information**	**Objective Information**	**My conclusion about the objective information**	**Further evidence I would like to collect**

- Provide guidance in presenting according to the rubric, for example:
    - I would like to talk to you about ______. They are ______.
    - We know objectively that ______ and I think this means that ______.
    - We also have been given the impression that ______ and I think this means that ______.
    - I think this means that ______ and we should be doing ______ and ______ to find out more information.
- For the reading/writing segment, provide text excerpts to help students identify relevant information on chemical and physical changes.
- Provide students with sentence frames to help them generate yes/no questions for Tess's rules:
    - "Does it ______?"
    - "Can it ______?"
    - "When you ______, does it ______?"

Activity Pages 9.1, 9.2

Support

Discuss compelling and clear introductions to the presentation, modeling a few examples.

ENGLISH LANGUAGE LEARNERS

Presenting

Beginning
Provide a graphic organizer to help students organize information for their presentations. Use the information to form an introduction, description, and conclusion about a single character.

Intermediate
Provide a graphic organizer to help students organize information. Work with them to compare the rubric to the information they are presenting.

Advanced/Advanced High
Ask students prompting questions from the rubric to help them define their conclusions and suggested next steps for their presentations.

ELPS 2.H; ELPS 4.D

Start Lesson

Lesson 9: Reactions

Speaking and Listening

45M

Primary Focus: Students will summarize the evidence on a character and offer opinions about its validity. **TEKS 5.1.A; TEKS 5.1.C; TEKS 5.6.H; TEKS 5.7.C**

PREPARING PRESENTATION (20 MIN.)

- Ask students to return to the character maps they developed in the previous lesson and review the evidence they gathered on their characters (either Julian and Kristal, Felix and the Squirrels, or Darla and the SUV). Remind them that in the previous lesson they first gathered information on the characters, then assessed the information for its objectivity.
- Tell students they will use the evidence they have gathered to present on their characters to the Sheriff. Their task is to evaluate the characters as potential suspects.
- Tell students they will use their analysis on subjective and objective evidence in their presentation, making a recommendation to the Sheriff on (1) Whether there is good objective evidence that the character is a suspect; (2) Whether there is subjective evidence the character is a suspect; and (3) What further investigation they think is necessary to establish the character's innocence or guilt. Finally, they should (4) Compare the strength of the evidence on the two characters they will be presenting on.
- Ask students to turn to Activity Page 9.1 as they prepare their presentations.
- As students prepare, circulate and check in. Point students to the rubric on Activity Page 9.2 to help them prepare.

GIVING PRESENTATION (20 MIN.)

- Ask students to present on their characters in their small groups (see Advance Preparation for organization). Alternatively, ask volunteers to present to you as the Sheriff.
- As students present, ask the rest of the class to fill in their rubrics in Activity Page 9.2. Remind students to listen respectively and attentively.

TEKS 5.1.A Listen actively to interpret verbal and non-verbal messages, ask relevant questions, and make pertinent comments; **TEKS 5.1.C** Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.6.H** Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response.

Check for Understanding

When the presentations are finished, take a class poll on the suspect that students would most like to investigate further. Ask volunteers to identify what in the presentations led them to choose this suspect.

CLASS DISCUSSION (5 MIN.)

- Finish by discussing with the class whether the use of subjective evidence is ever valid in assessing a character.
- You should make a distinction between:
  - The use of evidence as a scientist or when accusing someone in court (where objective evidence is the only valid use of evidence).
  - The use of subjective evidence in analyzing characters in literary texts and in giving detectives clues about where to look for more objective evidence.

Lesson 9: Reactions

Reading/Writing

45M

Primary Focus: Students will use textual evidence to distinguish between physical and chemical reactions and organize their writing to allow others to make the same distinctions. TEKS 5.6.H; TEKS 5.7.C; TEKS 5.12.B

SMALL GROUP: CHAPTER 6, PART 2 (25 MIN.)

Vocabulary

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 6. They will read the second half.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.B** Compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft.

Support

If students need more time, ask them to present on only one character they investigated in the previous lesson. (If they looked at Felix and the Squirrels, they would choose either Felix or the Squirrels.)

Challenge

Ask students to role-play as police officers as they present. Discuss how they might stand, and how they might address the Sheriff.

expose, v. make something visible by uncovering it

pry, v. use force to open

undergoing, v. experiencing

encased, v. completely surrounded

Vocabulary Chart for Chapter 6, Part 2, "The Quest for Clues"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary		expose undergoing encased
Multiple-Meaning Core Vocabulary Words		pry
Sayings and Phrases		

Small Group Read Chapter 6, "The Quest for Clues"

- Ask students to return to Chapter 6 and begin where they left off in the previous lesson.
- Tell students that they are once again switching from detective to scientist mode, but they should pay special attention because the two modes may be merging soon!
- Divide students into two small groups. Work with Small Group 1 as students complete the questions below. Ask Small Group 2 to complete the Activity Page in pairs as they read the text.
- Ask students to read from "Where did you disappear to this morning, sis?" to the end of the chapter.

Activity Page 9.3

- Ask students to turn to Activity Page 9.3 and complete the questions.

"It was—it was getting time to leave and—I spotted you out here so I thought I'd come and get you." The words tumbled out of his mouth in a sudden rush.

"Well," Amy said, watching him closely, "it's a good thing you did."

***

"Where did you disappear to this morning?" Matt asked later that day, as he twirled his rock pick between his dusty hands.

"I was looking around the camp for evidence of fossil thieves," Amy murmured.

"What did you find?"

"Not a single boot or tire print, and that can only mean one thing."

"Which is—?" Matt looked at Amy questioningly.

She leaned closer and dropped her voice to a whisper. "That the thief is one of us!"

Just then, Tess clapped her hands to get their attention. "You're almost ready for the next stage of the excavation process, which is removing the bones you've exposed from the rocks beneath them. This morning, Dr. Forester and I are going to show you how that's done."

They gathered around Dr. Forester, where she knelt by the leg bone she and Tess had been excavating. "The challenge in removing fossil bones from the underlying rock is to make sure we collect them without breaking them. If we tried to **pry** or chisel them out from underneath, we'd almost certainly break them. Instead, we use a clever technique called trenching. Take a look," she said, gesturing to the leg bone.

"After the entire bone was exposed on top, we started carefully chipping away the rock all around, about six inches out from the fossil. We chiseled down for several inches—well below where we think the underside of the leg bone is—and then started chiseling inward. As you can see here, what we've ended up with is our leg bone fossil sitting atop a narrow rock pillar."

"It looks like a mushroom," Kristal said.

"That's a very good description," Dr. Forester said. "Once we have this mushroom shape, we put what's called a plaster jacket around the mushroom cap."

Tess continued, pulling on a pair of thin, latex gloves. "I'm going to demonstrate how paleontologists make a plaster jacket. It's a little like a doctor putting a plaster cast on someone's broken arm."

"I broke my arm and had a cast once," Daria said.

"Then you'll know what this leg bone is going to feel like," Tess joked. She had set out a bucket, a jug of water, a roll of paper towels, a wooden spoon, long strips of a rough fabric, and a bag labeled plaster of paris. "First, I'm going cover the fossil with damp paper towels," Tess explained, laying several wet towels on the exposed bone. "That will keep the plaster from sticking directly to our fossil."

"Next, I'll mix a white, powdery compound called plaster of paris with enough water to make a thin paste." Tess added water to the plaster in the bucket and used the wooden spoon to stir the two ingredients together.

"It looks like runny, white frosting," said Felix, leaning over to peer into the bucket.

Tess held up a strip of the rough fabric. "Now I'll soak strips of this burlap in the wet plaster and then lay them onto the fossil." She fitted and wrapped the mushroom cap with plaster-soaked strips until the fossil was completely **encased**, except for the place on the underside where it was still connected to the little pillar of rock. "Now we wait for the plaster to harden."

"But won't it take a long time for all the water to evaporate so it dries?" Amy asked.

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"Actually the water isn't evaporating, Amy. Evaporation is a physical change in matter—a change in states. Here, the powdery plaster and the water I added to it are undergoing what's called a chemical change in matter. Remember that a physical change may alter some properties or the appearance of a substance, but it doesn't change what the substance is actually made of—its chemical composition. When matter undergoes a chemical change, however, its chemical composition does change. Typically, molecules of the starting substances break apart, and the atoms rearrange themselves to form new molecules of different substances.

"After a chemical change takes place, you end up with new types of matter, often new compounds, with different properties than those you started with. In this case, the plaster dust and the water are combining in a chemical change to produce a new type of matter: solid, hardened plaster."

Tess set the bucket of wet plaster in the middle of the group. "Unlike physical changes in matter, many chemical changes are not reversible. In other words, they can't be undone. Another clue that a chemical change is taking place is that energy is used up or given off in the process, often in the form of heat or light. With that in mind, I want you all to put your hands on the outside of this bucket and tell me what you feel."

Everyone leaned in and did just that. "It's warm!" Kristal marveled.

"When a mixture of plaster of paris and water undergo a chemical change, heat is given off," Tess explained,"enough heat to make the plaster quite toasty as it hardens!" She stood and peeled off her latex gloves.

Tess suggested they all eat lunch while the plaster jacket finished hardening. When they returned, Dr. Forester knocked on the jacket with her knuckles. "Good and solid. Now, Tess and I will break the cap off the mushroom, so to speak, and plaster over the hole on the bottom, just like we did the top."

While Tess gripped the jacket firmly, Dr. Forester used a hammer and chisel to break it free from the rock pillar. They flipped the jacket over and then applied more strips of plaster-soaked burlap to the bottom. When they

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were finished, the fossil was completely enclosed and looked like a huge, white egg.

"When it's dry," Tess explained, "we'll use permanent marker to write a fossil number, the date, and the location of the dig site on the jacket. Then we'll take it back to camp."

"Actually, I'd like us to stop working a little early today," Dr. Forester said. "Tess and I have been talking about our missing fossils, and I've decided to drive over to Dry Creek and tell the sheriff what happened. It's a long drive, so I'll stay overnight. I'll ask the sheriff to come back with me tomorrow morning and take a look around."

"Wow, a sheriff!" Felix exclaimed. "Just like the Old West. Those fossil thieves had better watch out!"

Tess asked Julian and Amy to help her carry the jacketed fossil bone down to where the two pickups were parked. As they set it gently into the back of one, Amy realized that Julian had hardly said a word since the snake incident that morning. When Tess headed back up to the dig site, he just stood by the pickup and kicked at one of the tires.

"Thanks again for saving me from the snake," she said. "I don't know what would have happened if you hadn't shouted at me."

Julian was silent for a long moment and then asked, "What do you think the sheriff will do to the fossil thieves if he catches them?"

Amy shrugged. "I suppose he'll arrest them."

Julian didn't say anything at all.

Check for Understanding

Ask the following questions of students and take a class poll each time.

Literal. I put two substances together in a test tube, and the tube became warm in my hands. Is it a physical or a chemical change? Why?

» Chemical change. They often lead to heat being given off.

Literal. I left some water in a glass outside on a hot day. When I went to fetch it, half of the water had gone. Is that a physical or a chemical change?

» Physical change. The water had evaporated but hadn't become a new form of matter. No other substance was used to mix with the water.

Literal. I used a new substance and recorded its color (purple). When I placed it in a bowl of water, it became green. Is it a physical change or a chemical change?

» Chemical change. The physical properties of the substance have changed.

Challenge

I used a different substance (also purple) and placed it in water again. This time, the water became purple and the substance disappeared. No heat was given off. Is it a physical or chemical change?

» It was probably a physical change; it sounds like the substance dissolved and formed a solution.

CREATE TESS'S RULES (20 MIN.)

Review Tess's Rules

- Ask students to turn back to Tess's rules that they created in Lesson 7 on Activity Page 7.2 and review how Tess created her rules and the rules they created.
- Read through Tess's criteria from Activity Page 7.2:
    - Can people use this to answer the question?
    - Is it possible to decide the answer to the question I ask in each case?
    - Is it organized in a way that is easy to understand and use?

Activity Page 7.2

Support

You should highlight the "often" and make sure students understand that this means it isn't always the case.

ENGLISH LANGUAGE LEARNERS

Writing
Understanding Text Structure

Beginning
Read, "When matter undergoes a chemical change, however, its chemical composition does change." Turn this into a yes/no question. Help students identify other sentences describing mixtures and turn them into yes/no questions.

Intermediate
Point students to relevant portions of the text and provide sentence frames to help them generate yes/no questions.

Advanced/Advanced High
Ask students to use an oral example to explain their flow diagram. Discuss the differences between the way the text is presented and their yes/no questions.

ELPS 3.I; ELPS 5.F

Differences between Physical and Chemical Changes

- Tell students they will create a version of Tess's rules for Physical and Chemical changes.
- Before they begin writing, create through class discussion a table on the board/chart paper on the differences between Physical and Chemical changes as below.

	Physical Changes	Chemical Changes
Chemical Composition	Chemical composition remains the same	Chemical composition changes
Physical Properties	Physical properties of matter (mass, color, etc.) remain the same	Physical properties of matter change
Heat or Light	You don't usually get heat or light as a result of changes in state	Often heat or light given off
Reversible?	Reversible	Not reversible

Creating Tess's Rules

- Ask students to turn to Activity Page 9.4 and, using the rules they created in Activity Page 7.2 as a guide, create new rules for chemical and physical changes.

1. Does the chemical composition remain the same? (Y/N/Don't know).
    a. If Y, physical change.
    b. If N, chemical change.
    c. If don't know, go to question 2.
2. Does the mass and color of the substance remain the same? (Y/N/Don't know).
    a. If Y, physical change.
    b. If N, chemical change.
    c. If don't know, go to question 3.
3. Did the substance give off heat or light? (Y/N/Don't know).
    a. If Y, chemical change.
    b. If N, probably physical change.
    c. If don't know, go to question 4.
4. Can you reverse the reaction (for example, by cooling down the substances if you heated them)? (Y/N).
    a. If Y, physical change.
    b. If N, chemical change.

Check for Understanding

Ask students to evaluate whether the new flow diagram meets Tess's criteria (the three bullet points in the beginning of Activity Page 7.2). Ask them to evaluate how a flow diagram helps readers distinguish between chemical and physical changes.

End Lesson

Activity Page 9.4

Support

Create "Tess's rules" together as a class.

Challenge

Ask students to use the flow diagram to evaluate plaster of Paris and cereal in milk.

LESSON

10 To Catch A Thief

PRIMARY FOCUS OF LESSON

Reading

Students will identify textual evidence used by the characters to support their claims. **TEKS 5.2.A.v; TEKS 5.4; TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.12.C**

Writing

Students will use their understanding of chemical changes to explain Amy's plan to the Sheriff. **TEKS 5.12.D**

Grammar

Students will understand how to use commas in a range of contexts. **TEKS 5.11.D.x**

Morphology

Students will understand how to use the roots *mit/mis*. **TEKS 5.3.C**

FORMATIVE ASSESSMENT

Activity Page 10.1	**Identifying Evidence** Table of evidence on chemical changes. **TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.12.C**
Activity Page 10.2	**Letter to the Sheriff** Explanation of Amy's plan. **TEKS 5.12.D**
Activity Page 10.3	**Commas** Use of commas. **TEKS 5.11.D.x**
Activity Page 10.4	**Morphology** Practice sheet on use of *mit/mis*. **TEKS 5.3.C**

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.9.E.ii** Recognize characteristics and structures of argumentative text by: explaining how the author has used facts for or against an argument; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft; **TEKS 5.12.D** Compose correspondence that requests information; **TEKS 5.3.C** Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo; **TEKS 5.11.D.x** Edit drafts using standard English conventions, including: italics and underlining for titles and emphasis, and punctuation marks, including quotation marks in dialogue and commas in compound and complex sentences.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (30 min.)			
Partner Read: Chapter 7	Partner	20 min.	❏ *The Badlands Sleuth* ❏ Physical and Chemical Changes (Digital Components) ❏ Activity Pages 10.1
Evaluate Use of Evidence	Whole Group	10 min.	
Writing (30 min.)			
Identify Amy's Plan	Whole Group	10 min.	❏ Rules on Commas (Digital Components) ❏ Activity Page 10.2
Letter to Sheriff	Independent	20 min.	
Language (30 min.)			
Grammar	Whole Group	15 min.	❏ Word Choices and Fill in the Blanks (Digital Components) ❏ Activity Page 10.3
Morphology	Whole Group	15 min.	❏ Roots Poster (Digital Components)
Take-Home Materials			
Practice Roots *mit/mis*			❏ Activity Page 10.4

ADVANCE PREPARATION

Reading

- Ensure that the table you created in the previous lesson is still displayed as below. This has also been placed in the digital components for this unit.

	Physical Changes	**Chemical Changes**
Chemical Composition	Chemical composition remains the same	Chemical composition changes
Physical Properties	Physical properties of matter (mass, color, etc.) remain the same	Physical properties of matter change
Heat or Light?	You don't usually get heat or light as a result of changes in state	Often heat or light given off
Reversible?	Reversible	Not reversible

- As an extension, you may wish to create your own game of "spot the chemical change" with a scoreboard for students. This can be a writing activity or a speaking and listening activity. Students should point to the "Tess's rules" they created to identify why their example is a chemical change.

Writing

- As additional support, you may wish to help students fill out the graphic organizer below as they prepare their letter to the Sheriff.

<table>
<tr><th></th><th>Matter Amy uses</th><th>What will happen to the matter?</th><th>Why is this a physical/chemical change (you may need to refer back to previous notes and chapters)?</th><th>Why does this help catch the thief?</th><th>Why is this objective evidence?</th></tr>
<tr><td>Part 1: Physical Change</td><td>Bowl of ice cubes</td><td>Melt–meaning it changes state from solid to liquid</td><td>Changes of state are physical changes: they are reversible, and the kind of matter remains the same (chemical composition doesn't change) (other explanations are acceptable)</td><td>The water will mean that the soles of the thief's shoes will get wet, so they stick to other things the thief steps in.</td><td rowspan="2">Only someone who walks into the lab will have plaster of paris on their shoes. There is no opinion on the person, just evidence of what action they took (where they walked).</td></tr>
<tr><td>Part 2: Chemical Change</td><td>Plaster of paris</td><td>Undergo a chemical change when it encounters water.</td><td>It is not reversible, it gives off heat, and it turns into a different form of matter.</td><td>When the water on the shoes encounters the plaster of paris, a reaction will occur and hard plaster will stick to the bottom of the shoes</td></tr>
</table>

Language

Grammar

- Write the following sentences on the board/chart paper for commas after *yes/no*. For the first two sentences, include the commas. For the second two, do not include commas.

  "Yes, I do think I want to be a paleontologist."

  "No, thank you, I don't want another snack."

  "Yes I think I will solve this case."

  "No I'm not afraid of dinosaurs."

- Write the following sentences on the board/chart paper for commas before tag questions. For the first two sentences, include the commas. For the second two, do not include commas.

  "You think I'm the culprit, don't you?"

  "It's very hot, isn't it?"

  "There are no footprints or tracks are there?"

  "Paleontology is fun don't you think?"

- Be ready to display the poster below which can be found in the Teacher Resources of this guide, or the digital components for the unit.

  Rules on Commas

  Rules on Commas

  You should place commas:

  - after an introductory element (before the subject of the sentence)
  - after the word *yes* or *no* when the sentence begins with that word
  - before the use of a question when that question is at the end of the sentence (a tag question)

Morphology

- Display the roots poster from Lesson 6, which is below. You may access a digital version in the digital components for this unit.

  Roots Poster

  Roots

  A root is the main element of a word that forms the base of its meaning. A prefix or suffix added to the root can change the meaning.

- Write the following word choices on the board/chart paper corresponding to the sentences in the chart. Alternatively, you can access a digital version in the digital components for this unit.

Word choices	Sentence
mislaid, admitted, omitted, dismissed	Amy was ready to write down the final clue when she realized she had ______ her notebook!
missile, remit, mission, permission	Amy's ______ was clear: to find the culprit.
emitted, omitted committed, permitted	The police officer ______ the message across the radio to the Sheriff.
submitted, dismissed, committed, mislaid	Matt ______ Amy's suggestion with a shrug.

Universal Access

- For the reading segment, provide students needing substantial support with the full guide below.
    - People providing strong evidence will usually provide more than one piece of evidence. The more the better.
    - People providing strong evidence will only report what they can observe (or see). They will provide facts, not opinions or guesses.
    - People providing strong evidence will be clear. They will not leave you to guess their meaning. They will use words and descriptions that are accurate.
- Provide students needing moderate support with the guide below and read aloud and explain as necessary.
    - You should consider how much evidence the campers provide.
    - You should consider whether the evidence is observable, or just thought to be happening.
    - You should consider how clear the explanation is. Is it easy to understand? Have they used precise words and descriptions?
- For the writing segment, provide a series of joining words (*because*, *and*, *therefore*, *this means*) to help students explain Amy's plan.
- Provide prompts on the audience for the text, for example:
    - The Sheriff knows a lot about crime, so he will want to know about whether this will provide objective evidence. Have you explained the objective evidence this plan will provide?
    - The Sheriff does not understand chemistry so you need to explain what a physical change is. Do you think someone who hasn't learned chemistry would understand this from your explanation?
- In the morphology segment, provide additional sentences on familiar and unfamiliar topics to help students decipher brainstormed words. Some examples are in the supports in the lesson.

Start Lesson

Lesson 10: To Catch A Thief

Reading

30M

Primary Focus: Students will identify textual evidence used by the characters to support their claims. **TEKS 5.2.A.v; TEKS 5.4; TEKS 5.7.C; TEKS 5.9.E.ii; TEKS 5.12.C**

PARTNER READ: CHAPTER 7 (20 MIN.)

Vocabulary

- Ensure that each student has a copy of the Reader and has located Chapter 7.
- As with previous units, preview the core vocabulary, identify the first core vocabulary word, and ask students to identify the bolded word in the chapter and in the glossary at the back of the book.

ramble, v. walk without any obvious purpose

boundaries, n. the limits of an area

cells, n. the basic building blocks of living things

tarnishing, v. a process by which some metals become dull

spangled, adj. covered with small shiny objects

sliver, n. thin, narrow piece

hunch, n. a guess based on feelings, not facts

irritation, n. state of feeling annoyed

Vocabulary Chart for Chapter 7, "The Clues Add Up"		
Vocabulary Type	**Tier 3** **Domain-Specific Words**	**Tier 2** **General Academic Words**
Core Vocabulary	tarnishing	ramble boundaries sliver hunch irritation
Multiple-Meaning Core Vocabulary Words	cells	
Sayings and Phrases		

TEKS 5.2.A.v Demonstrate and apply phonetic knowledge by identifying and reading high-frequency words from a research-based list; **TEKS 5.4** Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking-fluency. The student reads grade-level text with fluency and comprehension. The student is expected to use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.9.E.ii** Recognize characteristics and structures of argumentative text by: explaining how the author has used facts for or against an argument; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft.

Partner Read Chapter 7, "The Clues Add Up"

- Ask students to read the chapter in pairs. As with previous units, you may pair students a number of ways.
- Explain that both students will read the first page silently, and then one partner will read that page aloud. Next, they will both read the second page silently, and then the other partner will read that page aloud, and so on. Students can ask their partner for help with sounding out or defining words as necessary.
- Ask students to read until "fallen asleep."
- As they read, ask students to complete the table in Activity Page 10.1. Ask them to stop before they complete the second question.

Activity Page 10.1

Support

Discuss the following statement from Kristal: "And you can't un-toast marshmallows any more than you can un-burn wood." Identify with students why this is evidence for a chemical change.

Support

Work with a few pairs as they complete the questions.

Challenge

Ask students to use the Tess's rules they created in the previous lesson for each example the campers identify. Ask them to discuss whether their rules were appropriate for identifying chemical changes.

Chapter 7

The Clues Add Up

THE BIG QUESTION
How do you use chemistry to catch a thief?

"There is nothing like a great dinner after a long, hard day in the field." Felix patted his flat stomach as he lounged in a camp chair beside the fire. "I'm stuffed."

They were all sitting around the campfire again, listening to the wood crackle and pop, and watching sparks rise up toward the night sky. It was perfectly clear, and the moon had not yet risen, so the stars were incredibly bright. Amy had never seen so many stars before, but now she could easily see the pale streak of the Milky Way as it rambled across the heavens.

"Too stuffed to eat roasted marshmallows?" Tess asked, walking up with a bag of marshmallows and enough roasting sticks for everyone.

"Wait a minute! I think my appetite just came back," Felix said. He pushed two marshmallows onto the end of a stick and held them out near the flames.

Tess pulled up a chair and glanced around. "I know it feels a little strange without Dr. Forester here tonight. How about we play a little game to liven things up?"

"You mean like Charades or Twenty Questions?" Daria asked.

"Well, you guys should know me pretty well by now," Tess said, grinning at them. "I was thinking more along the lines of a good, rousing game of Spot the Chemical Changes!"

"Rules, please!" Amy said, giggling.

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"You must identify a chemical change that's taking place within the **boundaries** of the camp, and explain why it's a chemical change," Tess explained. "For every correct answer you get one point."

"And the person with the most points wins!" said Felix, popping his first toasted marshmallow into his mouth.

Matt's hand shot up. "The wood in the campfire is undergoing a chemical change, isn't it? And it's giving off both heat and light in the process."

"A point for Matt!" Tess cried. "Yes, when wood burns it is undergoing a very dramatic chemical change."

"And it's not reversible, either," Daria chimed in. "You can't turn the ashes into wood again."

"Excellent!" Tess agreed. "Who's next?"

"As my marshmallows are toasting," Felix murmured, "they're turning a delicious golden brown on the outside and they smell heavenly, too. That's got to be because a chemical reaction is taking place as they're heating up."

"A point for Felix!" Tess said. "The sugary substance of the marshmallow is undergoing a chemical change as it gets hot. It changes color and also gives off an odor, both signs that a chemical change is taking place."

"And you can't un-toast marshmallows any more than you can un-burn wood," Kristal said, gently pulling a perfectly roasted marshmallow off her stick and admiring it before taking a bite.

"Digesting marshmallows and other food has got to be a chemical reaction, too," Amy offered. "And we know the changes take place because our bodies grow and we get energy from the food we eat."

"A point for Amy, who is absolutely correct that all sorts of chemical changes take place in our digestive tracts," Tess said. "As we eat these marshmallows, for example, compounds in them are broken down in our stomach and intestines. During this process, atoms are rearranged to form

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entirely different molecules that our bodies use as building blocks for making substances, carrying out tasks, repairing **cells** and structures, and much more. Certain chemical changes that take place in cells are responsible for capturing energy released when compounds from food are broken down even further, and then converting that energy into a form that cells can use." Tess pulled a marshmallow off her roasting stick, letting it cool slightly. "Just think—there are trillions of cells in our bodies, and at any given moment, countless chemical changes are taking place in each one."

"I've got one," Kristal said, slipping a ring off her little finger. "My mom gave me this silver ring. She'll shine it up for me now and then with a special cloth, but within a couple of weeks it gets a little dull, like there is dirt on it. **Tarnishing**—that's what she called it. Is tarnishing a chemical change?"

"It certainly is," Tess said, "and it typically happens when molecules on the surface of a silver object interact with sulfur-containing compounds in the air. Unlike wood burning or food cooking, chemical changes such as tarnishing take place quite slowly. Definitely a point for Daria!"

As the game continued, Amy noticed that Julian was lost in thought, but he'd been like that all day. Daria, on the other hand, seemed nervous. Every few minutes she turned and looked out into the darkness, in the direction Dr. Forester had driven away before dinner.

Amy thought of Inspector Ellis. In every book, he listed all the clues in his notebook to help him see the case more clearly, just as she had been doing. Amy didn't have her notebook handy, so she picked up a stick and made a sort of list in the sandy soil. She drew symbols that stood for backpacks and disappearances, cell phones and snakes, discoveries and appearances and things people had said.

Inside her head, several clues fell together—click, click, click.

There was a pause in the game, and Amy took advantage of it. She leaned back in her camp chair and let out a huge yawn. "Sorry, everybody," she said. "I'm tired and I'm going to bed. I want to be wide awake and alert tomorrow morning when Dr. Forester comes back—*with the sheriff*," she

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added, emphasizing the three words. As she stepped past Matt's chair she tugged on his shirt, a signal that he should follow her.

"What's up?" Matt asked, as he joined her where she stood beyond the reach of the firelight.

"I'm doing what any good detective would do. I've put the clues together and come up with a plan."

"A plan for what?"

"A plan to solve the Case of the Missing Fossils," she said softly. "Meet me outside the kitchen tent after Julian and Felix have fallen asleep."

***

Amy picked her way slowly across the clearing toward the kitchen tent, trying not to make a sound. The moon had risen in the star-**spangled** sky as a silver **sliver** that gave off just enough light so she could see the shapes of all the tents. She paused and listened outside Tess' tent, but she heard nothing and hoped Tess was sound asleep. As Amy neared the kitchen, a familiar shape detached from the larger shape of the canvas structure.

"What took you so long?" Matt said in a loud whisper. "I've been waiting here for half an hour."

Amy placed a finger gently on her brother's lips. "Not so much noise. I'm late because Daria was tossing and turning and it took forever for her to fall asleep."

"Julian was asleep in record time, but Felix kept fiddling with his backpack for quite a while." Matt swatted at an insect. "So what are we doing here?"

"We're setting a trap for our fossil thief," Amy replied.

"Do you know who it is?"

Amy answered thoughtfully. "A good detective suspects everyone until she has the evidence to prove who did what—and why."

ENGLISH LANGUAGE LEARNERS

Reading
Evaluating Language Choices

Beginning
Provide students with a guide to help them identify and evaluate strong and weak use of evidence, for example, "How many pieces of evidence are there? More is better than fewer."

Intermediate
Provide students with a limited guide to help them identify and evaluate strong and weak use of evidence, for example, "How many pieces of evidence are there?"

Advanced/Advanced High
Ask students to explain why they think the evidence is strong or weak.

ELPS 4.G; ELPS 4.K

Support

You may wish to discuss with students the example of the tarnished ring. In this case, while Tess agrees it is a chemical change, there is no clear evidence offered for why.

EVALUATE USE OF EVIDENCE (10 MIN.)

- Before students complete the second question in their activity books, discuss with them what makes strong evidence. In particular, discuss
    - the amount of evidence offered (for example, if a camper says a change is nonreversible and identifies physical properties changing that is two pieces of evidence)
    - the quality of the evidence: is it observable (in other words, can you see the change the camper is identifying)?
- Ask students to complete the second question in Activity Page 10.1.

Check for Understanding

Ask students to contrast the evidence provided in the first two examples (wood burning and marshmallows), which had multiple pieces of clear evidence, and the later examples (food being digested and the silver tarnishing) where the evidence is less clearly presented and there are fewer pieces of evidence offered.

Lesson 10: To Catch A Thief

Writing

30M

Primary Focus: Students will use their understanding of chemical changes to explain Amy's plan to the Sheriff. TEKS 5.12.D

IDENTIFY AMY'S PLAN (10 MIN.)

- Ask students to continue to partner read until the end of the chapter (from "Amy picked her way . . .").

TEKS 5.12.D Compose correspondence that requests information.


The Plan
– Set a trap
– Use science: ice cubes / water
plaster of paris
– Suspect(s) may leave footprints behind
– Examine evidence

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"Okay, Miss Good Detective—how exactly are we going to do that?"

"Well, I'm guessing that whoever took the fossils is feeling pretty scared right now, because of the sheriff coming tomorrow. It's just a **hunch**, but I think he or she might try to return the fossils to the lab tent tonight."

"You mean we have to stand guard here all night and keep watch?" Matt hissed. "Sis, I'm so tired I can hardly keep my eyes open."

Amy shushed her brother again. "We're not going to stand guard. We're going to use chemistry to identify the culprit instead."

"Chemistry?" Matt asked, in a tone that made it sound like he thought his sister was crazy. "What do we know about chemistry that could help solve a crime?"

"Quite a bit, actually, if you've been paying attention over the past few days." Amy lifted the flap of the kitchen tent. "Follow me."

She slipped inside and flicked on her flashlight. After grabbing a big bowl and a dishtowel from a shelf, she headed over to the little refrigerator. "First, we need ice," she said, handing Matt the bowl and laying the towel in the bottom of it. As she emptied the ice cubes from two trays into the bowl, the towel muffled their clatter. She listened for a minute, straining to hear any sounds that might indicate someone else was awake. Except for the crickets, there was silence. "Now, let's head for the lab," she instructed.

Amy stopped outside the lab tent and took the bowl of ice cubes from Matt. One by one she placed the ice cubes on the ground directly in front of the tent's entrance.

"Amy, what on earth are you doing?" Matt asked impatiently.

"I'm exploiting a physical change in matter as the first step in solving the case," Amy replied. "The ice cubes will slowly melt over the next few hours. They'll change states from a solid to a liquid, making the ground wet here right in front of the tent. Anyone who enters the lab will get the soles of his or her shoes nice and damp."

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“So what good do wet shoes do us?” The irritation in Matt’s voice was growing.

“Trust me.” Amy stepped inside the lab, flicked on her flashlight, and shone it where boxes and supplies were stacked in one corner. “Help me find the plaster of paris.”

Matt quickly found the bag of white powder and dragged it into the center of the tent. “Okay, now what?”

Amy handed her brother a pair of latex gloves from a box on a shelf, and put on a pair herself. “Help me scatter plaster dust on the floor of the tent. Let’s start in the far corner and work back toward the entrance.”

“Amy, this is not just crazy,” Matt said, starting to scatter the plaster dust, “but Dr. Forester is going to be very annoyed when she sees this mess.”

“The plaster is the second part of my plan and makes use of a chemical change,” Amy said. “Remember what happened when Tess mixed water and plaster of paris at the dig site today?”

“It underwent a chemical change and the wet plaster hardened.”

“Exactly. So if someone comes into the lab tent tonight, he or she will step in the water from the melting ice cubes just before entering. The soles of this person’s shoes will be wet as he or she starts to walk around—”

“—and the plaster dust will stick to them.” A grin started to spread across Matt’s face. “The plaster and water will undergo a chemical change—”

“—and harden into plaster,” Amy finished. “We saw today how well plaster sticks to things. It should stick to shoe bottoms at least as well. Then, tomorrow morning at breakfast, we’ll check everyone’s shoes, and whoever is sporting plaster in the treads will have a lot of explaining to do.”

Matt was quiet for a long moment. “Amy, you are a good detective. That’s brilliant.”

Amy beamed.

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ENGLISH LANGUAGE LEARNERS

Writing

Beginning
With 1:1 support, help students create simple sentences from the notes taken in the graphic organizer. Prompt them to use joining words where appropriate.

Intermediate
In pairs or small groups, with prompting, have students create short paragraphs to describe each phase in Amy's plan, reminding them of the audience (the Sheriff).

Advanced/Advanced High
Ask students to explain their plan and how their audience (the Sheriff) and his knowledge on chemical matter will affect their writing.

ELPS 5.G

Evaluative. There is a physical change followed by a chemical change in Amy's plan. Can you identify them?

» physical: ice turning to water; chemical: plaster of paris and water reacting

- **Support.** As necessary read the following excerpts aloud to students to help them identify the correct steps in the plan:
    - **Excerpt 1:** "I'm exploiting a physical change in matter as the first step in solving the case," Amy replied. "The ice cubes will slowly melt over the next few hours. They'll change state from a solid to a liquid, making the ground wet here right in front of the tent. Anyone who enters the lab will get the soles of their shoes nice and damp."
    - **Excerpt 2:** "The plaster is the second part of my plan and makes use of a chemical change," Amy said. "Remember what happened when Tess mixed water and Plaster of Paris at the dig site today?"
    - "It underwent a chemical change and the wet plaster hardened."
    - "Exactly. So if someone comes into the lab tent tonight, he or she will step in the water from the melting ice cubes just before entering. The soles of this person's shoes will be wet as he or she starts to walk around—"
    - "—and the plaster dust will stick to them." A grin started to spread across Matt's face. "The plaster and water will undergo a chemical change—"
    - "—and harden into plaster."

LETTER TO SHERIFF (20 MIN.)

Activity Page 10.2

- Ask students to turn to Activity Page 10.2 and write a letter to the Sheriff explaining Amy's plan, and why it is a good way of identifying the culprit. Remind students that the Sheriff is not a chemistry expert so he will need help understanding the plan. There is an optional graphic organizer below to help students work.
- Either ask students to finish the letter at home, or collect Activity Books to review their letter.

	Matter Amy uses	**What will happen to the matter?**	**Why is this a physical/ chemical change (you may need to refer back to previous notes and chapters)?**	**Why does this help catch the thief?**	**Why is this objective evidence?**
Part 1: Physical Change	*Bowl of ice cubes*	*Melt– meaning it changes state from solid to liquid*	*Changes of state are physical changes: they are reversible, and the kind of matter remains the same (chemical composition doesn't change) (other explanations are acceptable).*	*The water will mean that the soles of the thief's shoes will get wet, so they stick to other things the thief steps in.*	*Only someone who walks into the lab will have plaster of paris on their shoes. There is no opinion on the person, just evidence of what action they took (where they walked).*
Part 2: Chemical Change	*Plaster of paris*	*Undergo a chemical change when it encounters water.*	*It is not reversible, it gives off heat, and it turns into a different form of matter.*	*When the water on the shoes encounters the plaster of paris, a reaction will take and hard plaster will stick to the bottom of the shoes*	

Check for Understanding

Ask students whether the plan will provide good objective evidence for who the thief is, and why.

Support

With the class, fill in the optional graphic organizer in Activity Page 10.2, found in the Advance Preparation for this unit and above.

Lesson 10: To Catch a Thief

Language

30M

GRAMMAR (15 MIN.)

Primary Focus: Students will understand how to use commas in a range of contexts. **TEKS 5.11.D.x**

- Remind students that in Lesson 6 they practiced using commas to separate introductory elements.

  Where should the comma be placed in the sentence "Underneath the shifting sands the dinosaur waited to be discovered"?

  » before *the dinosaur*, which is the subject of the sentence

- Tell students that today they will look at the use of commas in two other contexts: to set off the words *yes* and *no*, and to set off a tag question from the rest of the sentence.
- Tell students they will first look at commas to set off the words *yes* and *no*. Point to the sentences on the board you prepared.

  "Yes, I do think I want to be a paleontologist."

  "No, thank you, I don't want another snack."

  "Yes I think I will solve this case."

  "No I'm not afraid of dinosaurs."

- Ask students if they can identify where the commas are similarly placed in the first two sentences. Once students identify that it is after the *yes* or *no*, tell them that when you start a sentence with *yes* or *no*, you place a comma after it.
- With the class, place commas in the correct places for the remaining two sentences.
- Tell students that the second context in which they will investigate commas is when looking at a tag question. Tell students that a tag question is a question that is added at the end of the sentence.

TEKS 5.11.D.x Edit drafts using standard English conventions, including: italics and underlining for titles and emphasis, and punctuation marks, including quotation marks in dialogue and commas in compound and complex sentences.

- Point to the sentences on the board/chart paper.

  "You think I'm the culprit, don't you?"

  "It's very hot, isn't it?"

  "There are no footprints or tracks are there?"

  "Paleontology is fun don't you think?"

- Ask students if they can identify where the commas are similarly placed in the first two sentences. Once students identify that it is before the questions, tell them that when you finish a sentence with a question, you place a comma before it.
- With the class, place commas in the correct places for the remaining two sentences.
- Either in remaining time or at home, have students turn to Activity Page 10.3 and complete the practice questions.

Check for Understanding

Ask students to identify why the following sentence does not need a comma: "I'm afraid my answer is no."

MORPHOLOGY (15 MIN.)

Primary Focus: Students will understand how to use the roots *mit/mis*.

TEKS 5.3.C

- Refer to the Roots Poster you displayed in the classroom and read with students.
- Remind students that in Lesson 6 they looked at the roots *mit* and *mis*, which mean "to send."
- Tell students you will read a sentence aloud that is missing a word. Then, students must decide which word from the four options on the board best fits in the blank. Point out that the word choices are listed in the right column and the sentences are in the left column.
- Practice with the first sentence "Amy was ready to write down the final clue when she realized she had ______ her notebook!"

TEKS 5.3.C Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

Activity Page 10.3

Support

Display the poster in the Teacher Resources or digital components to help students.

Challenge

Ask students to come up with their own sentences with introductory elements, the words *yes* and *no*, or tag questions.

Support

Provide additional sentences that use the words *mission*, *transmitted*, or *dismissed* to give further practice in the correct use of those words.

ENGLISH LANGUAGE LEARNERS

Language
Reading/Viewing Closely

Beginning
Provide additional sentences on familiar topics for the optional words to allow students to decipher the meaning, e.g., "I bought a ticket for admission to the circus."

Intermediate
Provide additional sentences on topics related to the Reader to allow students to decipher the meaning of the optional words, e.g., "Dr. Forester permitted Julian to hold the fossil."

Advanced/Advanced High
Provide additional examples of the words used in context, e.g., "The alarm emitted a piercing noise."

ELPS 1.H; ELPS 4.F

Challenge

Ask students to infer why *transmitted* might have a root from the Latin meaning "to send."

Activity Page 10.4

- Ask students if they know which word best fits in the blank from the choices given. If students are having trouble, ask which words they could eliminate from the list to narrow down the options.
- Continue in this manner with the remaining as time permits.

  Amy's ______ was clear: to find the culprit. (*mission*)

  The police officer ______ the message across the radio to the Sheriff. (*transmitted*)

  Matt ______ Amy's suggestion with a shrug. (*dismissed*)

- Have students turn to Activity Page 10.4. Briefly review the directions and tell students to complete it for homework. Remind students to read the sentences carefully, as not all of the answers will be words with the root *mit/mis*.
- At a later date, make arrangements to check that students completed Activity Page 10.4 correctly.

Check for Understanding

Ask students to suggest new sentences using the words in the table you displayed that were not correct for the sample sentences.

End Lesson

Lesson 10: To Catch A Thief

Take-Home Materials

PRACTICE ROOTS MIT/MIS

- Have students practice roots *mit/mis*.

LESSON

11

Connecting the Clues

PRIMARY FOCUS OF LESSON

Writing/Reading

Students will organize evidence boards to track evidence on characters, distinguishing between fact and opinion. TEKS 5.1.D; TEKS 5.13.E

Speaking and Listening

Students will use the evidence they have collected to make an accusation. TEKS 5.1.C; TEKS 5.7.C; TEKS 5.12.C

FORMATIVE ASSESSMENT

Evidence Boards	**Evidence Boards** Create evidence boards to connect information. TEKS 5.1.D; TEKS 5.13.E
Activity Page 11.4	**Accusation to the Sheriff** Complete rubric on presentation. TEKS 5.1.C; TEKS 5.7.C; TEKS 5.12.C

TEKS 5.1.D Work collaboratively with others to develop a plan of shared responsibilities; **TEKS 5.13.E** Demonstrate understanding of information gathered; **TEKS 5.1.C** Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft.

LESSON AT A GLANCE

	Grouping	Time	Materials
Writing/Reading (45 min.)			
Reviewing Evidence	Whole Group	10 min.	❏ *The Badlands Sleuth* ❏ Organization for Evidence Board (Digital Components) ❏ Evidence Boards ❏ Activity Page 3.3 (character maps) ❏ Activity Page 11.1
Creating Evidence Boards	Small Group	35 min.	
Speaking and Listening (45 min.)			
Decide on Culprit	Small Group	20 min.	❏ How to Help Identify the Guilty Party (Digital Components) ❏ Activity Pages 11.1, 11.3, 11.4
Prepare Accusation	Small Group	10 min.	
Deliver Accusation	Small Group	15 min.	

ADVANCE PREPARATION

Writing/Reading

- Students should create evidence boards for the same characters they investigated in Lessons 8 and 9. Students will therefore complete evidence boards for either (i) Julian and Kristal, (ii) Felix and the Squirrels, or (iii) Darla and the SUV.
- The best way to manage evidence boards is by having large boards around the room, as with evidence boards in detective shows. There are some pictures of evidence boards in the Teacher Resources section of this Teacher Guide. Alternatively, you can access digital versions of this in the digital components for this unit. You may wish to use these for your own reference or display them for students as examples.
- Ensure that each small group has a number of pieces of paper to write evidence on and place on the board.
- Please see Universal Access for some additional scaffolding on how to organize the evidence boards.
- Students will continue to use the boards in the next lesson: they should remain on the wall.

Speaking and Listening

- Prepare the poster below, which can be found in the Teacher Resources or in the digital components for this unit.

  How to help identify the guilty party!

  Motive: Did the suspect have a reason to *want* to steal the fossils? What evidence do we have for that?

  Example: Someone who loses money because of a robbery probably does not have a motive.

  Means: Did the suspect have the practical ability to steal the fossils?

  Example: A little old lady probably did not have the strength to wrestle someone to the ground.

  Opportunity: Did the suspect have a chance to steal the fossils without being observed?

  Example: If someone was in a casino all night, and lots of people saw them there, they probably did not have the opportunity to steal something many miles away.

- If you believe students have already read ahead and know who the culprit is, ask different groups to make an accusation against different suspects (using the evidence boards as a guide).
- This lesson builds on many of the skills students have practiced throughout this unit—including giving presentations. This is a good opportunity to work with students to implement feedback from their work in Lessons 9, 7, and 5, for example.
- As with previous lessons, you may wish to use the rubric to assess a small group of students.

Universal Access

- Give some initial structure to the evidence boards by dividing the large cards as below. This is also in the digital components for this unit.

- Also be ready to display the model character maps from Lesson 3 again to discuss possible organization of evidence boards.
- If necessary, provide additional examples of subjective and objective information to help students distinguish between them.
- For the Speaking and Listening segment, provide students with stickers or labels for them to place against parts of the evidence board or Reader they wish to refer to.

- Before students create their accusations, work with select groups to identify links between the rubric and the statement they have chosen. For example:
    - "I have met the requirements in part 2 of the rubric by providing the following evidence from the text . . ."

Start Lesson

Lesson 11: Connecting the Clues

Writing/Reading

45M

Primary Focus: Students will organize evidence boards to track evidence on characters, distinguishing between fact and opinion. **TEKS 5.1.D; TEKS 5.13.E**

REVIEWING EVIDENCE (10 MIN.)

- Tell students they will now use the information they have gathered over the unit to figure out who they believe the fossil thief is!
- Remind students that, in previous lessons, they developed character maps for characters in the Reader and then considered whether the information reflected fact (objective information) or Amy's point of view (subjective information).
- Tell students that today they will decide how to organize the information they have collected so they can connect clues and decide whether their character is a likely suspect.
- Tell students that detectives often use evidence boards for this purpose. Today they will be creating their own evidence boards on a character/suspect, then using the class's evidence boards to find the culprit.
- Remind students that, in this unit, they have created documents with a wide variety of organization—from prose, like the text, to flowcharts, lists, tables, and other devices.
- Remind students that, when organizing information, the most important thing to bear in mind is "does this allow the reader to understand what I want them to understand?"

1. What were the purposes of the character map, and how did we evaluate how to organize it?
    » Answers will vary but should recap the pros and cons of the different versions of the character map. It should reflect the need to record information about the character and the kind of information that is being recorded.

TEKS 5.1.D Work collaboratively with others to develop a plan of shared responsibilities; **TEKS 5.13.E** Demonstrate understanding of information gathered.

2. What does the reader of an evidence board want to understand? What is its purpose? How does this compare to the character maps?
    - » Answers will vary but should include (1) the importance of seeing all the facts and being able to group the facts together to make connections; (2) being able to come to a conclusion; and (3) that while there are many similarities with the character maps, the need to create connections changes how you may wish to organize evidence boards.

- Tell students that when detectives make their final accusations about suspects, their evidence needs to be objective, or a court will not listen to it. Ask students how objective and subjective evidence could be reflected on the evidence boards.
- Finally, ask students whether they think the subjective evidence (Amy's point of view) is of any use to a detective. Through discussion, students should come to the understanding that while impressions of a character would not be "admissible evidence," they can still give clues about people and their motivations.
- You may wish to extend this discussion to consider how we judge others, including body language and appearance, and when this is and is not valid.

CREATING EVIDENCE BOARDS (35 MIN.)

- Divide students into small groups according to the characters they investigated in Lessons 8 and 9. Either each small group should create boards for two characters (for example, Julian and Kristal), or each small group should have one character (for example, one group has Julian and another Kristal).
- Ask students to spend five minutes as a group discussing how to organize and plan their boards. Ask students to fill out the first rubric on Activity Page 11.1 to help them decide how to organize their boards.
- Ask students to use the information they gathered in their character maps and throughout the unit to place pieces of evidence on the board. Ask them to identify information they think is relevant for their evidence boards, write it on paper, and pin it to the board. They can move pieces of paper around as they work.
- Ask students to decide if each piece of evidence is *for* the character having taken the fossils or *against* them having taken the fossils, and whether it is objective or subjective evidence.

Challenge

You may wish to ask students to spend 10 minutes adding to their character maps from the end of Chapters 6 and 7 for completeness. Although none of the evidence in these chapters is essential, students won't know that without actually analyzing it. Just like detectives or scientists, they must survey all available data in order to determine which pieces are essential and which are not.

Activity Page 11.1

Support

Work with small groups to plan their boards, or discuss as a class before students create their boards. You may wish to use the chart in the Universal Access section of Advance Preparation as a guide.

Evidence Boards

ENGLISH LANGUAGE LEARNERS

Writing
Understanding Text Structure

Beginning
Provide students with the example evidence board and ask them to use this board as the basis for their boards.

Intermediate
Provide students with the example evidence board and model character maps from Lesson 3. Have them choose one of the maps as the basis for their organization.

Advanced/Advanced High
Provide students with the example evidence board and model character maps from Lesson 3. Have them describe how they will organize their own boards.

ELPS 5.F

Challenge

Ask students to create and add a map of the campsite and dig site to the board to help them keep track of the characters' movements.

Support

Review the concept of "evidence."

Support

Give students a shortlist of possible suspects (for example, Julian, Felix, Darla) so they have fewer characters to evaluate.

Check for Understanding

Ask students to identify one piece of evidence on their board and explain why they have placed it in that position.

Lesson 11: Connecting the Clues

Speaking and Listening

45M

Primary Focus: Students will use the evidence they have collected to make an accusation. **TEKS 5.1.C; TEKS 5.7.C; TEKS 5.12.C**

DECIDE ON CULPRIT (20 MIN.)

- Display the Motives, Means, and Opportunity poster. Talk through each idea with students using the examples.

Check for Understanding

Ask students to come up with an example where a suspect *would* have the motive, means, and opportunity to do something.

TEKS 5.1.C Give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft.

- Ask students, in their small groups, to rotate around the room and look at evidence boards for each character. Ask them to use the table in Activity Page 11.2 to evaluate whether they think the character is a likely culprit.
- When students have finished looking at the evidence boards, ask them to spend five minutes in their small groups deciding who they think the most likely suspect is. If students cannot agree, take a group vote.

PREPARE ACCUSATION (10 MIN.)

- Ask students, in their small groups, to prepare a statement to the sheriff accusing one of the characters of being the fossil thief. Tell students they must decide which students will give the statement, or if they will rotate as they present.
- Ask students to turn to Activity Page 11.3 to help them as they create their statement.
- Suggest that, as they prepare their statements, students look at the rubric on Activity Page 11.4 that they will use during the statement.
- As students work, circulate and check in.

Activity Pages 11.2–11.4

Support

Nominate one student from each group to give the statement.

Support

Does any of your evidence include subjective evidence? Make sure you note this.

ENGLISH LANGUAGE LEARNERS

Speaking and Listening
Supporting Opinions

Beginning
Provide 1:1 support to help students label evidence on their boards and to map the rubric in their activity pages to their accusation.

Intermediate
Ask students to label pieces of evidence on the evidence boards and to explain how their opening statement maps to the rubric in their activity pages.

Advanced/Advanced High
Before presenting, ask students to show links from the Reader and evidence board to justify their arguments. Give feedback and support as appropriate.

ELPS 3.G; ELPS 4.J

Support

Before finishing the lesson, ensure students understand that Amy created her plan because there was not enough evidence to accuse someone. While the students have made good inferences from the evidence, we can't be sure who the culprit is.

DELIVER ACCUSATION (15 MIN.)

- Ask students, in their small groups, to make their accusations. Either do this with the whole class or pair small groups.
- As students present, ask the rest of the class to fill in their rubrics on Activity Page 11.4. Remind students to listen respectfully and attentively.

Check for Understanding

When the presentations are finished, take a class poll on the culprit. Ask students to cite a piece of evidence they used to identify the suspect as guilty.

End Lesson

LESSON

12 Aftermath

PRIMARY FOCUS OF LESSON

Reading

Students explain how plot lines are resolved by tracking characters' desires and resolution. TEKS 5.8.B; TEKS 5.8.C

Grammar

Students form and use the perfect verb tense. TEKS 5.11.D

Morphology

Students use words with a range of affixes and roots as clues for word meaning. TEKS 5.3.C

FORMATIVE ASSESSMENT

Activity Page 12.3	**Resolution Table** Create table showing resolution for characters. TEKS 5.8.B; TEKS 5.8.C
Activity Page 12.4	**Grammar** Complete sentences using verbs in perfect tense. TEKS 5.11.D

TEKS 5.8.B Analyze the relationships of and conflicts among the characters; **TEKS 5.8.C** Analyze plot elements, including rising action, climax, falling action, and resolution; **TEKS 5.11.D** Edit drafts using standard English conventions; **TEKS 5.3.C** Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

LESSON AT A GLANCE

	Grouping	Time	Materials
Reading (60 min.)			
Small Group: Read Chapter 8	Small Group	30 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 12.1, 12.2, 12.3 ❏ Resolution Table on board
Character Resolution	Whole Group	30 min.	
Language (30 min.)			
Grammar: Perfect Verb Tense	Whole Group	15 min.	❏ Perfect Tense Verbs (Digital Components) ❏ Activity Page 12.4
Morphology: Affixes and Roots	Independent	15 min.	

ADVANCE PREPARATION

Reading

- Students will continue to use their evidence boards in this lesson. Students who focused on Julian and Kristal should either be reassigned to one of the other characters, or should do the alternative activity during the small group read.
- You may wish to take additional time in class to discuss Dr. Forester's actions.
- This lesson contains a Think Aloud.
- On the board/chart paper create the following table:

	Daria	Felix	Squirrels	SUV
Character's wants				
Character's behavior				
Character's resolution				

Grammar

- Display the poster on perfect tenses. This can be found in the Teacher Resources for this unit and in the Digital Components.

Perfect Tenses Poster

Perfect Tense Verbs

1. Past Perfect

An action that was completed in the past *before something else happened*: "I had lunch before I went to the cinema."

2. Future Perfect

An action that will have been completed at some point in the future: "I will have solved four more cases by June."

3. Present Perfect

Includes

- An action that was begun in the past and continues in the present: "I have already run three miles!"
- An action done several times in the past and continued in the present: "I have played the piano since I was four."

- On the board/chart paper write the following sentences:

"The police had interviewed the suspect before they cracked the case."

"Yesterday when I arrived home I realized that someone had broken in!"

"Amy was disappointed at the bookstore because she had read all the detective novels."

Universal Access

- For the reading segment, provide a series of simple to complex connecting words on the board/chart paper to help students describe the links between information about the character, for example:
    - First we learned ______, then we found ______. Next we discovered ______. This means ______.
    - First we learned ______. We then saw the following ______. What we discovered about ______ links to this because ______.
    - We learned that ______. Consequently, her behavior, for example, ______, can be explained through ______, and specifically through ______.
- In the grammar segment, provide correct and incorrect sentences (one using past perfect, one not) and ask students to distinguish between them. Some examples are in the supports in the lesson.
- Provide lists of events and ask students to construct oral sentences linking them through the past perfect tense.
- In the morphology segment, provide additional sentences on familiar and unfamiliar topics to help students decipher brainstormed words. Some examples are in the supports in the lesson.

Start Lesson

Lesson 12: Aftermath

Reading

60M

Primary Focus: Students explain how plot lines are resolved by tracking characters' desires and resolution. **TEKS 5.8.B; TEKS 5.8.C**

SMALL GROUP READ: CHAPTER 8 (30 MIN.)

Vocabulary

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 8. They will read the first half only.

TEKS 5.8.B Analyze the relationships of and conflicts among the characters; **TEKS 5.8.C** Analyze plot elements, including rising action, climax, falling action, and resolution.

- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

fluffy, adj. light texture, filled with air

trace, n. a slight mark

reluctant, adj. unwilling

intention, n. aim or plan

appreciate, v. recognize the worth of

Vocabulary Chart for Chapter 8, "Cracking the Case"		
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**
Core Vocabulary		fluffy reluctance intention appreciate
Multiple-Meaning Core Vocabulary Words		trace
Sayings and Phrases		

Support

Model the first answer for students.

Challenge

Amy decides to support Julian. Would you do the same? Why?

Activity Page 12.1

Small Group Read Chapter 8, Part 1

- Ask students to read Chapter 8 in the same small groups as in the previous lesson. As with previous units, you should work with one small group to scaffold as necessary.
- As they read, ask students to complete the questions in Activity Page 12.1.

Chapter 8

Cracking the Case

THE BIG QUESTION
Why are pancakes light and fluffy?

"Breakfast!" Tess called out from the kitchen tent. "Come and get it!"

Amy fell into step beside her brother. "Okay, once we've started to eat, I'll pretend to drop something under the table, slip down there, and quickly check out the bottoms of everyone's shoes."

They sat down at the table with the others just as Tess came walking up with a huge platter of hot, **fluffy** pancakes and a bottle of maple syrup. "Good morning! This morning's breakfast is brought to you by another amazing chemical change!"

Felix eyed the pancakes hungrily. "Um, do you think you could explain that statement *while* we eat, rather than before?"

"Absolutely," Tess said, handing him the platter. "Last night after the campfire I was thinking about chemical changes that we encounter every day. Some of the most familiar ones have to do with food. When people cook or bake things, all sorts of chemical changes take place. For example, pancakes are light and fluffy thanks to a chemical change between two ingredients: baking soda and buttermilk. When these two substances are mixed together, atoms are rearranged and new types of molecules are produced. One of those new molecules is the gas carbon dioxide. Tiny bubbles of carbon dioxide gas form throughout the pancake batter and are trapped as the batter cooks and solidifies. The result is light and fluffy pancakes that are honeycombed with tiny air pockets."

Kristal peered at the pancake on her plate. "So that's why they look like they're full of little holes. I always wondered about that."

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Amy took a bite of her pancake. It was wonderful and she wished she could concentrate on simply enjoying it. But she was focused on the results of another chemical change this morning, one that had hopefully left traces on someone's shoes. She waited until everyone was busy eating pancakes, and then casually let her fork slip through her fingers.

"Whoops, dropped my fork," she said easily, and ducking under the table she quickly scanned the bottoms of everyone's shoes. Her plan had worked! Amy sat up and stared at Matt as he raised his eyebrows questioningly. She thought for a moment how to communicate her discovery, and then picked up the bottle of maple syrup. "Matt, would you pass the syrup to Julian?" she said, trying to sound casual. "It looks like he needs more."

Matt's eyes widened in surprise.

Felix was already helping himself to seconds. "These pancakes are great, Tess. Too bad Dr. Forester missed them."

"She planned to be back before we headed up to the dig site," Tess replied, "so I'm guessing she and the sheriff will be here soon. I'll make more batter when they arrive."

Amy noticed that when Tess said this, Julian swallowed hard and put down his fork. He looked scared. Amy's mind raced as she tried to think of what to do next. "Since we're going to put plaster jackets on more fossils at the dig site today," she said, turning to Tess, "how about Matt and I load up the plaster of paris and the other things we'll need?"

"That would be great," Tess said, pouring herself some coffee. "I can sit here and relax."

"Actually, why don't you help us, Julian?" Amy added, as she got up from the table. "It'll go faster with three."

When Amy stepped inside the lab, she saw the shoe prints in the plaster dust on the floor. They led from the entrance to the table, where all the missing fossil fragments now lay in a neat row.

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Julian stopped outside the tent entrance and then stepped inside reluctantly.

"I suspected that whoever took these fossils would bring them back," Amy said quietly, "what with the sheriff coming and all."

Julian looked about to deny it, but then stopped and let out a huge, unhappy sigh. "How did you know it was me?"

Amy explained about the ice, the plaster dust, and the shoes. Julian groaned and sat down heavily on a wooden crate full of tools. "I suppose you're going to tell Dr. Forester when she gets here—and the sheriff."

"How about you tell us why you took the fossils in the first place?" Amy said.

Julian hung his head and said, "I didn't mean to take them, really. Everything just went wrong." He paused and then plunged ahead. "Remember when Dr. Forester was so excited about the first set of fossils, but wanted us to wait until morning to see them? Well, I didn't want to wait. So I snuck in here later that night to see them for myself. I'd picked one up to look at it more closely. Then I thought I heard someone coming, and without thinking, I shoved the fossil into my pocket and slipped out the back of the tent."

52

“Why didn’t you just admit it the next morning when Dr. Forester found it missing, and give it back?” Matt asked. “It’s not like you meant to steal it. She would have believed you.”

“I didn’t think she would. I figured she’d be really angry, and send me home, and I didn’t want that to happen. I thought I’d just put the fossil back when no one was looking, and she’d just assume she had misplaced it. But every time I tried to do that, either Tess or Dr. Forester was here in the lab.” Julian poked at the tent floor with the tip of his shoe. “Then we found more fossils, and Dr. Forester started talking about how great it would be if she could get some of them to fit together. I thought since I had the missing piece, maybe I could use it to figure that out, and maybe it would turn out be an important new discovery, and I might be famous, and then my dad—,” Julian’s voice trailed off.

“What about your dad?” Matt asked quietly.

“Then my dad might be proud of me, like he is of my brother Jack.”

Amy and Matt exchanged a long look.

Julian hung his head again and picked at a seam on his jeans. “It was a silly idea, of course. Once I had the fossils, I couldn’t make any sense of them. I couldn’t even figure out a way to put them back in the lab without getting caught. So I put them in a sack and hid them under a bush.”

“And then Dr. Forester went off to get the sheriff, thinking we’d been robbed by fossil thieves,” Amy said.

Julian nodded. “So last night I brought the fossils back and put them there on the table. It seemed better than being caught with them red-handed or having to admit in front of everyone what I did. I didn’t think much further than that.”

No one spoke for a long moment. Julian looked from Amy to Matt and back to Amy again. “So, what are you going to do? Are you going to tell Dr. Forester I stole the fossils?”

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“No, but you are,” Amy said quietly. “I think Dr. Forester will understand that it wasn’t stealing in the normal sense of the word, because your **intentions** were good.”

Julian looked doubtful, but he nodded, sighing. “You’re right. I’d feel better if I came clean, even if Dr. Forester decides to send me home.”

“I think your chances are pretty good, actually,” Matt said.

“We’ll be there to support you, too,” Amy added. “And I’ll be sure to mention that you saved me from that snake!”

Sudden shouts and the sound of a car horn interrupted her. “Dr. Forester must be back,” Amy said. “Let’s meet her together, okay?” Julian nodded and quietly followed Amy and Matt out of the tent.

Everyone gathered around the pickup. “Where’s the sheriff?” Felix asked, as Dr. Forester got out.

“He had something else he needed to do, but he’ll be here by mid-morning,” she replied. “And he did help explain the SUV we saw. It was a rancher the sheriff knows, out looking for lost cattle.”

“While we’re waiting, let’s pack up our gear,” Tess said. “We have a long day of excavating ahead.”

Amy, Matt, and Julian hung back, and the other campers followed Tess. “Dr. Forester?” Amy said, glancing quickly at Julian. “Would you mind coming into the lab with us? There’s something we need to show you.”

Dr. Forester looked quizzically from Amy to Matt and Julian and back to Amy again. “No problem,” she said. “Lead the way.”

It took Dr. Forester only a few seconds to spot the fossils all lined up on the table in the lab. “Now this is a surprise!” She picked up each fossil, examining it closely. “And they are all here, even the one that first went missing.” She crossed her arms and looked at them expectantly. “So, I assume someone is going to explain?”

54

Check for Understanding

Refer to the class poll from the previous day. Ask students to name one piece of evidence they'd noticed that pointed to Julian, and one piece of evidence they'd missed that pointed to Julian.

Small Group Read Chapter 8, Part 2

- Ask students to consider how the author gave clues about Julian's motives and actions in the chapters leading up to Chapter 8.
- Review the table students completed in their groups, along with their evidence boards. Ask students to review the information they were given about (a) Julian's motives and (b) Julian's means and opportunity in different parts of the Reader.
- Tell students that in the rest of the chapter, the author ties up loose ends about the other suspects: Felix, Daria, the SUV, and the squirrels.
- Ask students to continue reading Chapter 8 in their small groups. As they read, ask them to add the final information they learn about Daria, Felix, the squirrels, and the SUV to their evidence boards. Ask students to use the table on Activity Page 12.2 to help them.
- Students who completed boards for Julian and Kristal should either join other small groups or do one of the following alternative activities:
    - Add the information from Activity Page 12.1 to Julian's evidence board.
    - Write an answer to the following writing prompt: "Do you think that Julian's motives meant Dr. Forester was right not to punish him? Use evidence in the text in your answer."

Activity Page 12.2

Support

Review in each example whether this is subjective or objective information.

Challenge

Introduce the concept of "red herrings" and ask students if there were any that led them to believe Daria was guilty. Ask if those red herrings were objective evidence or Amy's subjective point of view.

Julian cleared his throat. “Yes, ma’am, I am.” In a shaky voice, he proceeded to tell Dr. Forester the whole story. Amy chimed in about the snake, and Matt added that Julian felt really bad.

When they were finished, Dr. Forester was quiet for a long time. Then she nodded, as if deciding something. “I **appreciate** your honesty, Julian. And I hope you’ve learned that you should always tell the truth right away. Things just tend to get worse if you don’t.”

Julian nodded and stared at the ground. “When do I have to leave?”

Dr. Forester put her hand on his shoulder. “It took a lot of courage to confess what you did. And I think your worrying about all this has probably been punishment enough. You’re welcome to stay.”

Julian beamed a huge smile. “That’s fantastic. This camp is the most fun I’ve ever had!” Then his smile faded. “But how are we going to explain to the others that the fossils are back?”

Dr. Forester thought for a moment and then said, “Leave that to me.”

When they all joined Tess and the others, Dr. Forester held up her hand. “There has been an unexpected turn of events,” she said, gesturing toward the lab tent. “The missing fossils have been found. Let’s just say—” she paused as a hush fell over the group—“our prime suspect is a curious ground squirrel who decided to make off with the bones rather than food.”

For a moment, everyone was silent. The silence was followed by laughter and loud conversations. Suddenly Tess’s voice rose above all the others. “What about the sheriff?”

Dr. Forester frowned. “That’s a problem. He’s going to make the long drive out here for nothing, and I’ve got no way to reach him.”

“You could call him!” Daria offered. “I know a place where you can get a cell phone signal.”

Dr. Forester looked surprised. “You do?”

55

"I was pretty homesick the first couple days, so I tried my phone in lots of different places. The other night I found a spot not far from camp where I got two bars!"

Dr. Forester dug her cell phone out of her pocket. "Please show me that spot, Daria, so I can call the sheriff and save him the trip."

As they left, Amy nudged Matt and whispered, "That explains Daria's late-night walk."

When Dr. Forester and Daria returned, Felix arrived with his huge backpack and set it down on the table outside the kitchen tent.

"Gather around, everyone," Felix said. "I'm disappointed we won't get to meet a real western sheriff. But the return of the fossils calls for a celebration, and I've got just the thing." He unzipped the backpack's main compartment and started taking out candy bars and packets of beef jerky, peanuts, jelly beans, licorice, and all sorts of other yummy treats.

"Felix, what is all this?" Tess asked, staring at the growing pile of food.

"Survival rations!" he said gleefully. "I always carry this much food with me, just in case hunger strikes and the next meal is still hours away. And aren't you all just dying for a treat?" He smiled his mischievous grin.

Matt nudged Amy. "That explains a lot."

Amy nodded, pleased with how well things had turned out. The Case of the Missing Fossils was solved, and Julian was able to stay. Fossil Camp felt suddenly right and happy—and she had cracked the case!

CHARACTER RESOLUTION (30 MIN.)

- Tell students they will explore, as a class, how Chapter 8 has provided *resolution* for the character.
- Remind students that they looked at a story's resolution in the Grade 4 Contemporary Fiction unit. The resolution explains what happens after the climax of the story (in this case Julian being caught) and often ties up loose ends of the plot.
- Using a Think Aloud, discuss the resolution for Daria. First review the following pieces of evidence (asking students to identify these on their evidence boards):
    - In Chapter 2, Daria says she missed her mom (then quickly pretends she wants to talk to her friends).
    - At the end of Chapter 4, Daria is out mysteriously late. She gives the following excuse "Um . . . ah . . . I went for a long walk" and sounds "strangely excited." She then quickly says good night.
    - She "seemed nervous" during Chapter 7.
    - At the end of Chapter 8 it is revealed that she has been looking for a cell phone signal to call home.
- Tell students that you can divide this evidence into three parts: Daria's *wants*, her *behavior*, and her *resolution*.
- Fill in the table you created on the board/chart paper for Daria as you speak (see below). Ask students to fill the table in Activity Page 12.3 as you work. You should keep this table for the following day.

	Daria	**Felix**	**Squirrels**	**SUV**
Character's wants	She misses her mother			
Character's behavior	She disappears into the night (objective) She seems "strangely excited" later (subjective) She seems "nervous" at the campsite (subjective)			
Character's resolution	She was out in the middle of the night (her behavior) because she found a signal to call her mother (her wants)			

Activity Page 12.3

ENGLISH LANGUAGE LEARNERS

Reading

Understanding Cohesion

Beginning
Provide a series of simple connecting words. Work through the text with students to help them describe what they learned about the character.

Intermediate
Help students use nuanced connecting words in describing what they learned about the character in the text. Point students to relevant parts of the text.

Advanced/Advanced High
Have students use complex connecting words to describe how the character's resolution ties to their wants and behavior.

ELPS 4.F

Support

Students may need help with the "wants" of the squirrels and the SUV. The squirrels seek food and mistake other objects for food: hence the "excuse" resolution that they grabbed the fossils.

- Completing the table as a class, ask small groups in turn to volunteer information for the wants, behavior, and resolution of the remaining characters.
- **Challenge.** Tell students that in theater there is a concept called "Chekhov's gun." It means that if you see a gun on stage at some point in the play, it will be used. It will never be just a prop. Ask why the squirrels might be a case of "Chekhov's squirrels"?

Check for Understanding

Ask students which one of the four characters had "wants" that might have led them to take the fossils.

Support

There is no information given about the SUV's "wants" before this chapter: The people in the SUV were looking for lost cattle.

Lesson 12: Aftermath

Language

30M

GRAMMAR: PERFECT VERB TENSE (15 MIN.)

Primary Focus: Students form and use the perfect verb tense. TEKS 5.11.D

Introduce Perfect Tenses

- Tell students that they will be investigating the perfect tense. Display the poster from the Teacher Resources/Digital Components.
- Explain the poster to students, and tell them they will look at each of these tenses in turn.

Perfect Tense Verbs

1. Past Perfect
    - An action that was completed in the past *before something else happened*: "I had lunch before I went to the cinema."
2. Future Perfect
    - An action that will have been completed at some point in the future: "I will have solved four more cases by June."

TEKS 5.11.D Edit drafts using standard English conventions.

3. Present Perfect

Includes:

- An action that was begun in the past and continues in the present: "I have already run three miles!"
- An action done several times in the past and continued in the present: "I have played the piano since I was four."

Practice Past Perfect

- Tell students they will begin by practicing the past perfect tense.
- Point again to the sentence that reads "An action that was completed in the past *before something else happened*: 'I had lunch before I went to the cinema.'"
- Ask students to explain why the example sentence meets the rules laid out in the definition.
- Ask students to look at the sentences you prepared earlier on the board/chart paper. Working as a class, identify the order of the actions.
- In each case ask students to identify the past perfect (highlighted) and make the connection that this was the action *preceding* a later action.
- "The police **had interviewed** the suspect before they cracked the case."
  - » (*first they interviewed the suspect, then cracked the case*)
- "Yesterday when I arrived home I realized that someone **had broken** in!"
  - » (*first they broke in, then I arrived in*)
- "I was disappointed at the bookstore because I **had read** all the detective novels."
  - » (*first I read the detective novels, then visited the bookstore*)
- Ask students to turn to Activity Page 12.4 and work on the practice questions. They may take them home to complete.

Check for Understanding

Ask students to create their own sentences using the past perfect tense.

ENGLISH LANGUAGE LEARNERS

Language
Using Verbs and Verb Phrases

Beginning
Practice saying sentences aloud using the past perfect tense, and then say the sentence again incorrectly. Ask students to identify the correct use.

Intermediate
Provide students with additional events and ask them to orally provide sentences using the past perfect tense.

Advanced/Advanced High
Ask students to describe two events they experienced this morning, linking them using the past perfect tense.

ELPS 3.C

Activity Page 12.4

Support

Continue to model the practice questions as a class.

Challenge

Ask students to find examples of the past perfect tense in the Reader (they may wish to start reading Chapter 9).

ENGLISH LANGUAGE LEARNERS

Language
Reading/Viewing Closely

Beginning
Provide sentences for the example words for students to decipher and apply the meaning. ("When I realize how much I achieved this year I feel amazement.")

Intermediate
Provide additional sentences related to the Reader allowing students to decipher the meaning of brainstormed words. ("I transmitted the message to the Sheriff.")

Advanced/Advanced High
As necessary, give students additional examples of the words used in context. ("Don't worry, the disease won't transmit to humans.")

ELPS 1.H; ELPS 4.F

Support

Continue to practice with additional sentences using the words *emit*, *missile*, *commit*, *permit*, *admit*.

Challenge

Ask students to come up with new sentences.

MORPHOLOGY: AFFIXES AND ROOTS (15 MIN.)

Primary Focus: Students use words with a range of affixes and roots as clues for word meaning. **TEKS 5.3.C**

- Remind students that in the past few units they have investigated a range of affixes and roots.
- Tell students they will review the affixes –*en,* –*ment* and the roots *mit/miss*.
- Remind students that a prefix is a syllable or syllables placed at the beginning of a root word to change the word's meaning.
- Write the word *close* on the board.
- Ask students to read the word. Discuss its meaning and ask students to name the part of speech.
    - » to shut; verb
- Add the prefix *en*— to *trap* and have students read the new word.
- Ask students what the prefix *en*– means.
    - » in
- Ask students what *enclose* means and what part of speech it is.
    - » close in; verb
- Remind students that a suffix is a syllable or syllables placed at the end of a root word to change the word's meaning.
- Write the word *amaze* on the board. Ask students to read the word. Discuss its meaning and ask students to name the part of speech.
    - » surprise; verb
- Ask students what the suffix –*ment* means.
    - » a state of being
- Add the suffix –*ment* to *amaze* and have students read the new word. Ask students what *amazement* means and what part of speech it is.
    - » state of being surprised; noun
- Remind students that a root is the main element of a word that forms the base of its meaning.
- Write the word *transmit* on the board. Ask students to read the word. Discuss its meaning and ask students to identify the root in the word.
    - » to send on; Latin root *mit* means to send

TEKS 5.3.C Identify the meaning of and use words with affixes such as trans-, super-, -ive, and -logy and roots such as geo and photo.

Check for Understanding

Take a few minutes, as a class, to brainstorm words that can have –*ment* added to the end of them.

Check for Understanding

Ask students to fill in the following sentence using the words they have investigated to date.

- I ______ a message to the Sheriff: "I have been ______ by a criminal!" The Sheriff replied, "I heard your message with ______. How could you have been so silly?"

End Lesson

LESSON

13

Round and Round

PRIMARY FOCUS OF LESSON

Reading

Students integrate information from multiple sources to explain recycling as a chemical process. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.7.E; TEKS 5.13.C**

Language

Students form and use the perfect verb tense. **TEKS 5.11.D**

Writing

Students describe the plot resolution for two characters.

TEKS 5.7.C; TEKS 5.8.B; TEKS 5.8.C; TEKS 5.12.C

FORMATIVE ASSESSMENT

Activity Pages 13.1 and 13.2	**Chapter 13** Annotate diagrams showing plastic creation and photosynthesis. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.7.E; TEKS 5.13.C**
Activity Page 13.3	**Grammar** Verbs. **TEKS 5.11.D**
Activity Page 13.5	**Resolutions** Opinion piece on character resolution. **TEKS 5.8.C; TEKS 5.12.C**

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources; **TEKS 5.11.D** Edit drafts using standard English conventions; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters; **TEKS 5.8.C** Analyze plot elements including rising action, climax, falling action, and resolution; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft.

LESSON AT A GLANCE

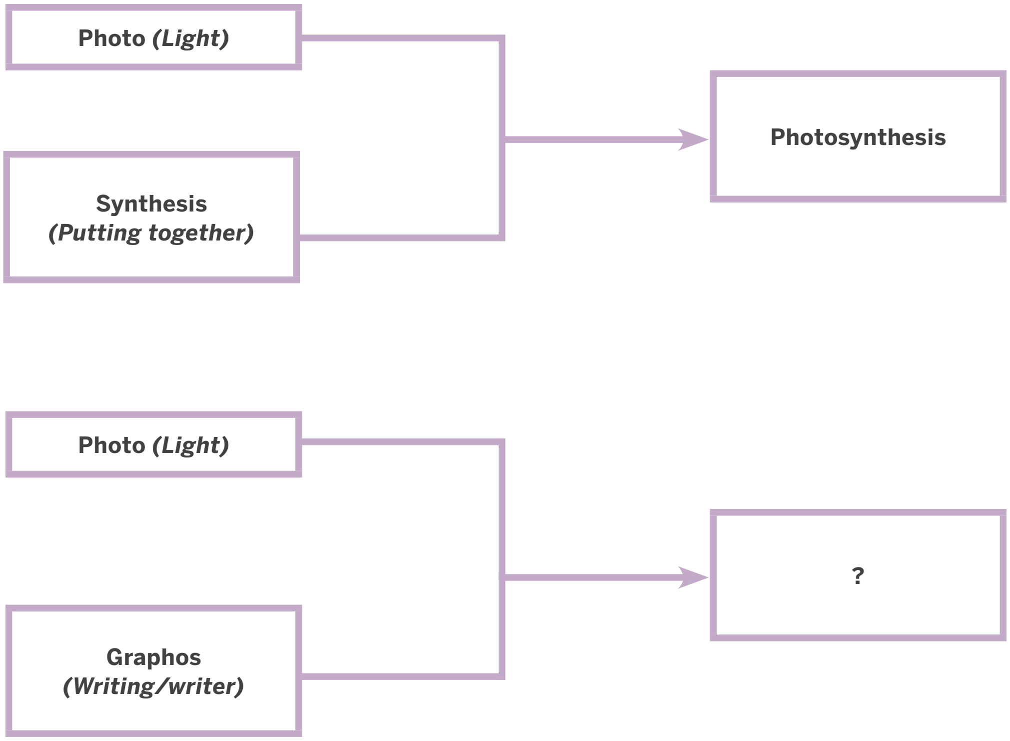
	Grouping	Time	Materials
Reading (45 min.)			
Read and Integrate Information: Chapter 9	Partner	20 min.	❏ *The Badlands Sleuth* ❏ Activity Pages 13.1, 13.2 ❏ Scientific Definitions Poster (Digital Components)
Integrate Information	Partner	20 min.	
Word Work: *Photosynthesis*	Whole Group	5 min.	
Language (15 min.)			
Perfect Verb Tense	Whole Group	15 min.	❏ Activity Page 13.3
Writing (30 min.)			
Resolution	Whole Group	15 min.	❏ Activity Page 13.4
Write Opinion Piece	Independent	15 min.	

ADVANCE PREPARATION

Reading

- There are two activities in this segment. If students have excelled at combining information from different sources, ask them to complete both activities. Otherwise, ask students to only do the photosynthesis activity.
- The annotation activities can be extended by asking students to use additional resources from the library, the Internet, or science class. If you do this, review the use of appropriate and reliable sources first.
- Prepare the poster on scientific definition found in the Teacher Resources section of this Teacher Guide. Alternatively, you may access a digital version of this in the digital components for this unit.

Scientific Definition Poster



Grammar

- Display the Perfect Tenses Poster from the previous lesson. This can be found in the Teacher Resources for this unit and in the Digital Components.
- On the board/chart paper write the following sentences:
    - "The culprit will have escaped by the time we arrive."
    - "The mystery will be solved by tea time."
    - "I will be old before you make up your mind!"

- "I have read that book a dozen times."
- "I have known Matt my entire life."
- "Matt has made a lot of new friends."
- "I've been starving for hours!"

Writing

- Ensure students have access to the wants and resolutions table you created in the previous lesson.
- Depending on time, you may wish students to write about both characters' resolutions or just one.

Universal Access

- Provide students needing substantial support with pieces of paper with the following quotes from the Reader:
    - "In photosynthesis, the atoms making up molecules of water and carbon dioxide are recombined, using energy from sunlight, to produce molecules of sugar and oxygen gas."
    - "Plants release the oxygen into the air, and use the sugar molecules to grow and build their bodies, including the parts that animals and people eat for food."
    - "The cells of all living things produce carbon dioxide as a waste product. We get rid of it by exhaling."
    - "Some chemical changes that are part of decomposition return carbon to the air as carbon dioxide."
    - "Perhaps, thanks to chemical changes, some of Achy-Breaky's atoms are now part of compounds in the soil or the water or the air."
- Also provide multiple copies of chemical formulae on pieces of paper, for example:
    - Carbon dioxide has the formula CO_2.
    - Water has the formula H_2O.
    - Oxygen has the formula O_2.
    - Sugar has the formula $C_6H_{12}O_6$, where "C" stands for carbon, "H" stands for hydrogen, and "O" stands for oxygen.
- Provide a way for students to stick the pieces of paper onto the diagram in Activity Page 13.2.

- Provide sentence frames to help students identify cause and effect before annotating their diagram, for example:
  - First the compounds ______ and ______ are combined to make ______. This happens on the ______.
  - Plants release ______, which is breathed in by ______.
  - ______ is released by ______.
- In the grammar segment, provide correct and incorrect sentences (one using the perfect tense, one not) and ask students to distinguish between them. Some examples are in the supports in the lesson.
- Provide lists of events and ask students to construct oral sentences linking them through the future and present perfect tense.
- For the writing segment, provide a series of simple to complex connecting words in sentence frames on the board/chart paper to help students describe the links between information on the character. For example:
  - First we learned ______, then we found ______. Next we discovered ______. This means ______.
  - First we learned ______, then we then saw the following ______; for example, ______. What we discovered about ______ links to this because ______.
  - We learned that ______. Consequently, her behavior, for example, ______ can be explained through ______, and specifically through ______.

Start Lesson

Lesson 13: Round and Round

Reading

45M

Primary Focus: Students integrate information from multiple sources to explain recycling as a chemical process. **TEKS 5.6.H; TEKS 5.7.C; TEKS 5.7.E; TEKS 5.13.C**

READ AND INTEGRATE INFORMATION: CHAPTER 9 (20 MIN.)

Introduce the Chapter

- Ensure each student has a copy of the Reader, *The Badlands Sleuth*, and has located Chapter 9.

TEKS 5.6.H Synthesize information to create new understanding; **TEKS 5.7.C** Use text evidence to support an appropriate response; **TEKS 5.7.E** Interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating; **TEKS 5.13.C** Identify and gather relevant information from a variety of sources.

- Have students turn to the table of contents, locate the chapter, and then turn to the first page of the chapter.
- As with previous units, preview the relevant core vocabulary, identify the first core vocabulary word, and ask students to identify the word bolded in the chapter and in the glossary at the back of the book.

Vocabulary

glossy, adj. shiny and smooth

blazing, adj. very hot

decompose, v decay, break down

photosynthesis, n. process by which plants use sunlight to get food from water and carbon dioxide

fragment, n. small part broken off something

juvenile, n. a young creature or person

Vocabulary Chart for Chapter 9, "A New Day, A New Dinosaur!"		
Vocabulary Type	**Tier 3 Domain-Specific Words**	**Tier 2 General Academic Words**
Core Vocabulary	decompose	glossy blazing fragment
Multiple-Meaning Core Vocabulary Words	photosynthesis	juvenile
Sayings and Phrases		

Integrate Information: Plastics

- Ask students to read Chapter 9, "A New Day, A New Dinosaur" as individuals or in pairs. As with previous units, you may pair students a number of ways.
- Students should read up to "That's absolutely amazing".
- As they read, ask students to complete the questions in Activity Page 13.1 in pairs or individually.
- As students work, circulate and check in.

Support

You may wish to create a timeline as a class to trace the creation of plastic bottles (300 million years ago, 1900s, today) and discuss what process happened between and in each period.

Support

If time is a concern, students should concentrate on the photosynthesis activity to follow.

Challenge

Ask students to compare the way Tess uses the word *recycling* with the way we use it in every day life.

Activity Page 13.1

Chapter 9

A New Day, A New Dinosaur!

THE BIG QUESTION
Why is chemcial change the ultimate recycler?

Amy traced the entire edge of the dinosaur jawbone with the tip of her finger. She and Matt had finished excavating it, and she enjoyed the feel of the smooth, **glossy** fossil. A blazing sun hovered over the dig site, but after the success of the morning and the return of the missing fossils, for once the heat didn't bother her. Maybe she was getting used to it.

On the other side of the dig site, Tess was showing Felix and Daria how to use a rock hammer and chisel to carefully chip away the rock around several back bones they'd excavated in preparation for encasing them in a plaster jacket. Matt and Amy were next in line to learn this technique, and Amy couldn't wait to mix the plaster of paris and water. The chemical change that took place when that happened was one she'd really grown to appreciate.

Kristal was sitting on the ground, sketching Julian as he scraped away the last of the sandstone around the dinosaur foot bones that they had been working on. Amy was pleased to see that Julian was back to being his normal self. And Dr. Forester was sitting off in the shade at the far end of the plateau, happily studying the strange little bones with a magnifying glass. She'd announced that from now on, she wasn't letting them out of her sight and was even going to sleep with them next to her cot at night.

Tess stood up and tugged off her safety goggles. "I think it's already time for a water break, everyone, because the heat today is fierce." Matt retrieved bottles of cold water from the ice chest, and Amy was reminded of their first day of digging and the discussion of matter. It suddenly struck her how much chemistry they'd all learned since.

"You're pretty sneaky, Tess," she said with a laugh as they all sat down under the tarp at the edge of the dig site. "We came to Fossil Camp to learn about fossils, and you ended up teaching us chemistry, too."

Tess smiled. "So you haven't minded all my chemistry lessons?"

Amy shook her head. "It's been really interesting, especially learning about chemical changes. I like the idea that chemical changes can turn one type of matter into another by shuffling atoms around that go on to bond in new combinations."

"In a way, I supposed it's a bit like recycling," Felix said thoughtfully, staring at his water bottle. "What I mean is, when we recycle these plastic bottles, they'll be remade into something new."

"Actually, chemical changes are the ultimate recyclers," Tess replied, "because they recombine the same elements over and over again in different combinations to form new types of matter. A plastic water bottle already has a long history of recycling, Felix, from a chemical change point of view. Would you like to hear the story?"

Everyone said yes, so Tess drained the last of the water from her bottle and began. "Imagine you had a time machine and you set the dial for 300 million years ago. You stepped out into a warm, humid, green world full of forests and swamps teeming with tall trees, gigantic ferns, and all sorts of other ancient plants. Plants and plant-like organisms grew in the ancient oceans, too. All of those green, growing things, like all living things today, had bodies built mostly from compounds that contain atoms of the element carbon.

"Because there was so much plant life living and growing on the earth 300 million years ago, there was also a lot of plant life dying. Some of those dead organisms decomposed relatively quickly. Some were buried and fossilized like Achy-Breaky. But some underwent different kinds of chemical changes that transformed their carbon-rich remains into the carbon-rich substances we call oil and coal."

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“So carbon atoms that were once in the bodies of ancient, green, growing things are now in oil and coal?” Julian asked.

“Not all of them, of course, but a lot of them,” Tess said. “Now zoom forward in your time machine to the 1900s, when chemists started playing around with the carbon-rich compounds in oil. They discovered chemical processes that could change some of those compounds into plastics.” She held up the empty water bottle. “In other words, carbon atoms that were once in the bodies of three-hundred-million-year-old lifeforms became part of oil deep in the ground and are now part of this plastic bottle in my hand.”

Matt whistled softly and shook his head. “That’s absolutely amazing.”

“Actually, everywhere you look in nature you see the recycling of elements thanks to chemical changes.” Tess reached over and plucked a blade of prairie grass from a nearby clump. “Like all plants, including plants that grew 300 million years ago, this grass carries out something called **photosynthesis**. That’s a process in which water and the gas carbon dioxide undergo a chemical change.”

“Carbon dioxide—that’s the same gas that makes pancakes fluffy, right?” Kristal asked.

“Yes, that’s the one,” Tess said. “In photosynthesis, the atoms making up molecules of water and carbon dioxide are recombined, using energy from sunlight, to produce molecules of sugar and oxygen gas. Plants release the oxygen into the air, and use the sugar molecules to grow and build their bodies, including the parts that animals and people eat for food.”

“So atoms of carbon, oxygen, and other elements that were once in the air or the water became part of plants, and then became part of us when we ate the plants,” Daria said.

“Exactly,” Tess said.

“But how did the carbon dioxide get into the air in the first place?” Felix asked.

INTEGRATE INFORMATION (20 MIN.)

- Ask students to continue reading the chapter up to "'Thanks, Achy-Breaky,' he said, 'I needed that.'"
- As students read, ask them to answer the questions and activity in Activity Page 13.2.
- As students work, circulate and check in.

Activity Page 13.2

ENGLISH LANGUAGE LEARNERS

Reading
Reading/Viewing Closely

Beginning
Provide quotes from the Reader and multiple copies of the chemical compound formulas. Work with students to stick these onto their diagram at relevant points and explain their reasoning.

Intermediate
Use sentence frames to explain cause and effect before writing relevant information on the diagram.

Advanced/Advanced High
Ask students to choose the relevant portion of the text. Provide support as they choose relevant key words from the text to describe what is happening.

ELPS 4.F; ELPS 4.J

Support

Students may struggle with the connection between the carbon dioxide animals exhale and the carbon dioxide plants use for photosynthesis. Ask them not to worry about compounds from Achy-Breaky's body and only describe this process.

“Excellent question, Felix.” Tess took a deep breath and let it out slowly. “The cells of all living things produce carbon dioxide as a waste product. We get rid of it by exhaling.” Then she gestured toward the fossils that lay in the rock beside them. “Whenever something dies, like good old Achy-Breaky, the compounds in its body are broken down and the atoms that formed them are recycled. Some chemical changes that are part of decomposition return carbon to the air as carbon dioxide.”

“You mean that when we take a breath, we’re breathing in carbon atoms from something that died?” Daria asked.

Tess burst out laughing. “Yes, I guess you are, but atoms are no different if they are in something dead or in something alive. They are just atoms.”

Tess glanced at her watch. “One last thing I’d like you to think about, and then we should get back to work. You’ve been working on Achy-Breaky for several days now. You’re getting to know him. But think about this as well: When this amazing dinosaur died, the compounds that made up his body were broken down by chemical changes. The atoms that were once part of those compounds moved on. Perhaps, thanks to chemical changes, some of Achy-Breaky’s atoms are now part of compounds in the soil or the water or the air that you are breathing.”

A hush fell over the group as they stared at Achy-Breaky’s bones, warm and shining in the bright sunlight. Amy knew she would never look at those bones in quite the same way.

Felix stood up and took a deep breath. “Thanks, Achy-Breaky,” he said. “I needed that.”

They all burst out laughing and picked up their tools to resume their work.

Before they could even get started, however, Dr. Forester came hurrying over. Her face was aglow with excitement, and she held a fossil in one hand and her magnifying glass in the other. “I found something,” she said, in a voice that made them stop everything they were doing. “I found unmistakable evidence that these strange little fossil bones are those of a small dinosaur. Come and look!”

Check for Understanding

Ask students to orally describe how one element or compound: sugar, carbon dioxide or oxygen, is recycled through photosynthesis, pointing to their annotated diagram as they speak.

WORD WORK: *PHOTOSYNTHESIS* (5 MIN.)

- Remind students that in earlier lessons they looked at how Latin and Greek roots were used to create scientific terms.
- Display the scientific definitions poster for this lesson. Point out that photosynthesis only occurs in direct sunlight.

1. **Evaluative.** Why do you think scientists used the roots *photo* and *synthesis* to describe the process we have been reading about?
    - » Answers will vary but should make the connection that in photosynthesis the plant is making things (synthesis) in the presence of light (photo).

- Ask students to look at the roots in the second half of the poster—*photo* and *graph*. Ask a student to read what the root *graph* means (writer or writing).

2. **Inferential.** What modern word do you think is made up of these roots?
    - » photograph

3. **Evaluative.** Why do you think we use the roots *photo* and *graphos* to describe photographs?
    - » Answers will vary but should make the connection that photographs are taken in the light, and that the photograph "writes" (or draws) what is in the outside world onto photographic paper.

Challenge

Ask students to link the information they annotated in the water cycle in Lesson 3 to describe how water becomes available to plants for photosynthesis.

Activity Page 13.3

ENGLISH LANGUAGE LEARNERS

Language
Using Verbs and Verb Phrases

Beginning
Practice saying sentences aloud using the future perfect tense, and then say the sentence again incorrectly. Ask students to identify the correct use.

Intermediate
Provide students with additional events and ask them to orally provide sentences using the past perfect tense.

Advanced/Advanced High
Ask students to describe two events they will experience later that day and linking them using the future perfect tense.

ELPS 3.C

Support

Continue to model the practice questions as a class.

Challenge

What were the preceding and succeeding actions in this sentence from the Reader? "Then, tomorrow morning at breakfast, we'll check everyone's shoes and whoever is sporting plaster in the treads will have a lot of explaining to do."

Lesson 13: Round and Round

Language

15M

Primary Focus: Students form and use the perfect verb tense. TEKS 5.11.D

PERFECT VERB TENSE (15 MIN.)

Practice Future Perfect

- Display the perfect tense poster.
- Remind students that in the previous lesson they began investigating the perfect tense and looked at the past perfect tense
- Ask a student to read out the description of the future perfect tense from the poster (an action that will have been completed at some point in the future: "I will have solved four more cases by June.").
- Ask students to explain why the example sentence meets the rules laid out in the definition.
- Ask students to look at the sentences you prepared earlier on the board/chart paper. Working as a class, identify the order of the actions.
- In each case, ask students to identify the future perfect (highlighted) and make the connection that this was the action *preceding* a later action.

  "The culprit will have escaped by the time we arrive." (first the culprit will escape, then we will arrive)

  "The mystery will have been solved by tea time." (first the mystery will be solved, then it will be tea time)

  "I will have grown old before you make up your mind!" (first I will get old, then you will make up your mind)

- Ask students to turn to Activity Pages 13.3 and work on the practice questions. They may take these home and complete.

TEKS 5.11.D Edit drafts using standard English conventions.

Practice Present Perfect

- Ask a student to read out the description of the present perfect tense from the poster. (An action that was begun in the past and continues in the present: "I have already run three miles!" An action that was done several times in the past and continues in the present: "I have played the piano since I was four.")
- Ask students to explain why the example sentences meet the rules laid out in the definitions.
- Ask students to look at the sentences you prepared earlier on the board/chart paper. Working as a class, identify which of the rules each sentence follows.
    - "I have read that book a dozen times." (repeated action)
    - "I have known Matt my entire life." (started in the past and continues)
    - "Matt has made a lot of new friends." (repeated action).
    - "I've been starving for hours!" (started in the past and continues)
- Ask students to turn to Activity Pages 13.3 and work on the practice questions. They may take these home and complete.
- Highlight that these are not the only uses of the present perfect tense.

Check for Understanding

Ask students to create their own sentences using the future perfect and present perfect tense.

Support

Complete the table as a class.

Activity Page 13.4

ENGLISH LANGUAGE LEARNERS

Writing
Understanding Cohesion

Beginning
Provide a series of simple connecting words and work through the text with students to help them describe the character.

Intermediate
Help students use nuanced connecting words in describing how they learned about the character through the text. As necessary, point students to relevant portions of the text.

Advanced/Advanced High
Ask students to describe, using complex connecting words, how the resolution of the character ties to their wants and behavior.

ELPS 5.F

Challenge

Does Tess have wants? Are they resolved?

Lesson 13: Round and Round

Writing

30M

Primary Focus: Students describe the plot resolution for two characters.

TEKS 5.7.C; TEKS 5.8.B; TEKS 5.8.C; TEKS 5.12.C

RESOLUTION (15 MIN.)

- Remind students that in the previous lesson they investigated how different characters' "wants" were resolved.
- Point students to the table they completed in the previous lesson on the board/chart paper and in Activity Page 12.3.
- Ask students, in pairs, to read the remainder of Chapter 9.
- As they read, ask them to consider Dr. Forester and Amy. Tell them they will be discussing the wants and resolution for these characters.
- As they read, ask them to fill in the table on Activity Page 13.4.

TEKS 5.7.C Use text evidence to support an appropriate response; **TEKS 5.8.B** Analyze the relationships of and conflicts among the characters; **TEKS 5.8.C** Analyze plot elements including rising action, climax, falling action, and resolution; **TEKS 5.12.C** Compose argumentative texts including opinion essays using genre characteristics and craft.

They gathered around her as she held up one of the fossils. "The key was this piece, the one that went missing right away." She pointed to part of the fossil fragment. "This piece is definitely from a dinosaur skull. I can tell because there are telltale ridges in the bone that are places where muscles attached in a way unique to dinosaurs."

"What kind of dinosaur was it?" Daria asked.

"That's the really exciting part," Dr. Forester replied. "Based on the curve of this piece, it's from a very small dinosaur. At first I thought it might be from a baby dinosaur or a **juvenile**. But other features that I've identified this morning are only found in skulls of dinosaurs that are fully grown. That means that this dinosaur was an adult." She stopped and looked at everyone. "But I've never seen an adult dinosaur with a skull this small, which means we might just have discovered a new species. I'm not absolutely positive at this point, but I am certain enough to be very excited."

"Wow, a new species!" Felix exclaimed.

"That means you could be famous, Dr. Forester," Julian said, smiling. "You told me so on our first day here."

"That's where you're wrong, Julian," Dr. Forester said softly. "A discovery like this could mean that you'll all be famous. Whatever we discovered, you all helped discover it, and that means you get your names on the scientific paper that we will write about this little dinosaur."

"It'll need a name," Amy said, taking the small piece of bone from Dr. Forester and cradling it in her hand. "It will need a scientific name like *Acheroraptor temertyorum*," she said, sounding out the syllables slowly.

"How about *Fossilcampus fantasticum*?" said Felix gleefully.

When they'd stopped laughing, Tess glanced at her watch again. "Okay, fossil campers, let's get back to work. Tonight we can sit around the fire and talk all you want to about this new discovery. But don't forget, we have a bigger dinosaur to work on, with lovely bones that need to be excavated, jacketed, and transported back to camp."

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Amy watched as everyone picked up their tools and resumed tasks that just a few days ago had seemed strange and new. They had learned so much and gained so many skills. For Amy, Fossil Camp had turned out to be far better than she had ever anticipated. Who knew that digging up fossil bones under the hot sun—in a place with snakes—would turn out to be so much fun, or that she'd discover she could use physical and chemical changes to solve a real mystery?

'*Inspector Ellis*,' she thought, '*here I come!*'

WRITE OPINION PIECE (15 MIN.)

Activity Page 13.5

- Ask students to complete the writing prompt on Activity Page 13.5: Think about Amy or Dr. Forester. Do you think the Reader provided a satisfying resolution for their character? Explain your answer using evidence from the text. Ask students to either choose one of the characters, direct them to write about one, or ask them to write about both.

Check for Understanding

Ask student volunteers to read aloud their opinion pieces, and ask other students to make constructive comments about the volunteer's use of textual evidence.

End Lesson

LESSON

14

The Next Case

PRIMARY FOCUS OF LESSON

Writing

Using their analysis of literary and informational textual elements, students create a narrative and then revise it in response to peer feedback.

TEKS 5.11.A; TEKS 5.12.A

FORMATIVE ASSESSMENT

Activity Page 14.2	**Story** Draft the first chapter of a detective story. TEKS 5.11.A; TEKS 5.12.A

TEKS 5.11.A Plan a first draft by selecting a genre for a particular topic, purpose, and audience using a range of strategies such as brainstorming, freewriting, and mapping; **TEKS 5.12.A** Compose literary texts such as personal narratives, fiction, and poetry using genre characteristics and craft.

LESSON AT A GLANCE

	Grouping	Time	Materials
Writing (90 min.)			
Story Plan	Independent	45 min.	❏ *The Badlands Sleuth* ❏ Plot Diagram (Digital Components) ❏ Activity Pages 14.1, 14.2 ❏ Additional resources
Writing a Narrative	Independent	45 min.	

ADVANCE PREPARATION

Writing

- Other than assessments and Pausing Points, this is the final lesson of the year. This activity is designed to be a fun conclusion to fifth grade.
- While it is written as a single lesson, this activity can be expanded to many lessons, and include research from a number of sources. If you wish to include research, it may be helpful for students to spend some time researching interesting science topics before beginning their story plans.
- Given this extensibility, this lesson is written more flexibly than previous lessons in the program.
- To aid this expansion, the Pausing Point lessons are dedicated to expanding this writing activity.
- Display the table on story plans. This can be found in the Teacher Resources for this unit. It is also found in the digital components for the unit.
- Use the diagram to talk through each of the components of story planning, which should all be familiar to the students. Brainstorm interesting words and plot details as a class.

	Details	**Description—words I plan to use**
Setting	*a space station in the year 3030*	*alien, crowded, diverse*
Characters	*Amy, a young chemical detective*	*intrepid*
My characters' "wants"	*Amy wants to figure out why she's there.* *The chief scientist on the space station wants to be famous.* *The apprentice wants to be noticed by the chief scientist.*	
How will my story begin?	*Amy wakes up to find herself in a pod, with no memory of how she got there.*	
How will my story end?	*Amy proves the space station is an elaborate hoax!*	
The plot (sequence of events)	*(see separate diagram)*	
What scientific content might I use?	*Amy shows that the "scientists" who brought her there were using incorrect science: they must be actors!*	

Start Lesson

Lesson 14: The Next Case

Writing

90M

Primary Focus: Using their analysis of literary and informational textual elements, students create a narrative and then revise it in response to peer feedback.

TEKS 5.11.A; TEKS 5.12.A

STORY PLAN (45 MIN.)

Introduce Amy's Next Case

- Tell students that they will be spending today (and possibly subsequent lessons) developing their own detective stories.
- Tell students their task is to start writing a story about Amy's next case. Apart from two rules they must follow, students have complete freedom. Rule number 1: Amy must be the detective. Rule number 2: The case's resolution should include some kind of chemical component or other scientific content.
- Remind students that they have created narratives before, including in the Personal Narratives unit.

Brainstorming Story Plans

- Display the story plan table below and use the categories and the example "plot" to discuss the components of story planning.
- During the discussion, brainstorm interesting plot details and ideas with students. Ask students to copy down ideas they find interesting. You may also wish to create a brainstorm diagram on the board/chart paper as you discuss.
- You can also brainstorm interesting adjectives and descriptive words they could use in their stories.

	Details	**Description words I plan to use**
Setting	*a space station in the year 3030*	*alien, crowded, diverse*
Characters	*Amy, a young chemical detective*	*intrepid*
My Characters' "Wants"	*Amy wants to figure out why she's there.* *The chief scientist on the space station wants to be famous.* *The apprentice wants to be noticed by the chief scientist.*	

TEKS 5.11.A Plan a first draft by selecting a genre for a particular topic, purpose, and audience using a range of strategies such as brainstorming, freewriting, and mapping; **TEKS 5.12.A** Compose literary texts such as personal narratives, fiction, and poetry using genre characteristics and craft.

	Details	Description words I plan to use
How will my story begin?	*Amy wakes up to find herself in a pod, with no memory of how she got there*	
How will my story end?	*Amy proves the space station is an elaborate hoax!*	
The plot (sequence of events)	*(see separate diagram)*	
What scientific content might I use?	*Amy shows that the "scientists" who brought her there were using incorrect science: they must be actors!*	

You may wish to spend some time on the scientific content, in two contexts. First, discuss how the scientific content might be introduced. Remind students that Tess answering campers' questions was the device for the story they read. In the example you are discussing, Amy might find scientific content in the space station's computer banks. Second, discuss what subjects might be interesting. You may wish to reference content in previous domains or from science class.

Activity Page 14.1

Creating Story Plans

- Ask students to turn to Activity Page 14.1 and create their own story plans. Tell them that they can always change their mind later.
- As students work, circulate and check in.

Support

Ask students to create their plots in small groups.

Challenge

Ask students to create plots for each other to write stories about.

Check for Understanding

Ask students to volunteer their plot outlines. As a class, discuss the scientific content and how it links to the plot.

Activity Page 14.2

WRITING A NARRATIVE (45 MIN.)

First Draft

- Once students have finished their plans, ask them to begin writing their introductory chapters. Ask them to write for 20 minutes.
- At the end of 20 minutes, ask students to share their work with a peer and discuss.

- Model this by asking for a volunteer to read their piece aloud to the class (alternatively, read an example you created). Praise the strengths of the work, focusing particularly on (i) the use of elements in the table, (ii) the link between the setting and the scientific content, (iii) descriptive elements.
- After five minutes, ask the recipient of the feedback to thank their partners and give an example of a helpful comment. When the other member of the pair has received feedback, ask students to swap and repeat the exercise.
- If time permits, have students type their persuasive essay.

Check for Understanding

Ask students to volunteer a constructive suggestion their partner made.

Notes for Revision

- Ask students to write three notes below their drafts that explain how they would revise and strengthen their work. Remind students that their changes could be organizational or focus on specific content, characters, or language.
- If there is time, ask students to start their second drafts. Remind students that authors go through many drafts of their work before finishing. You may wish to let students know that you would like them to continue working on their stories at home and in future lessons.

Check for Understanding

Ask students to provide examples of revisions they wish to make.

End Lesson

ENGLISH LANGUAGE LEARNERS

Writing
Modifying to Add Details

Beginning
Provide adjectives and adverbs that students can use to enrich their first sentences. Then ask them to suggest some others for their second sentences.

Intermediate
Brainstorm with students on their first paragraphs by coming up with adjectives and adverbs they can choose from to enrich their writing.

Advanced/Advanced High
Review students' first paragraphs. Challenge them to offer at least three new potential descriptive words (adjectives and adverbs) to enrich their writing.

ELPS 1.A; ELPS 5.G

Support

Model changes you would make to your work based on the peer feedback conversation you previously modeled.

LESSON

15

Unit Assessment

LESSON AT A GLANCE

	Grouping	Time	Materials
Unit Assessment (75 min.)			
Unit Assessment	Independent	75 min.	❏ Activity Page 15.1
Optional: Writing (15 min.)			
Narrative Building	Independent	15 min.	❏ Activity Page 14.2

ADVANCE PREPARATION

Grammar

- Collect Activity Page 12.4 to review and grade as there is no grammar lesson today.

Start Lesson

Lesson 15: Unit Assessment

Unit Assessment

75M

UNIT ASSESSMENT (75 MIN.)

Activity Page 15.1

- Make sure each student has a copy of Activity Page 15.1. You may have collected this activity page from students at the beginning of the unit.
- Tell students they will read two selections, answer questions about each, and respond to a writing prompt. In the next sections, they will answer grammar and morphology questions evaluating the skills they have practiced in this unit.
- Encourage students to do their best.
- Once students have finished the assessment, encourage them to review their papers quietly, rereading and checking their answers carefully.
- Circulate around the room as students complete the assessment to ensure everyone is working individually. Assist students as needed, but do not provide them with answers.

Reading Comprehension

The reading comprehension section of the Unit Assessment contains two selections and accompanying questions. The first selection is an informational piece about the production of salt. The second selection is a literary piece that contains chemical content.

These texts are considered worthy of students' time and meet the expectations for text complexity at the Grade 5 level. The texts feature core content and domain vocabulary from the Chemical Matter unit that students can draw on in service of comprehending the text.

Analysis of the Text

The texts used in the reading comprehension assessment, “The Ancient Art of Making Salt” (informational text) and “The Atomic Ice Cream Shop” (literary text), have been profiled for text complexity using standard quantitative and qualitative measures.

Reading Comprehension Item Annotations and Correct Answer

Note: To receive a point for a two-part question, students must correctly answer both parts of the question.

Item	Correct Answer(s)	Standards
1 Literal	B	TEKS 5.3.B
2 Evaluative	“the evaporation process may take many months or even years until all the water has changed state into water vapor”	TEKS 5.3.B
3 Literal	Deposits underground From seawater From Great Lakes	TEKS 5.7.C
4 Evaluative	Students should link this text to the earlier explanation of evaporation	TEKS 5.6.F; TEKS 5.6.H
5 Inferential	A. Students should reference her description of the lesson	TEKS 5.3.B; TEKS 5.6.F
6 Evaluative	Figurative (metaphor)	TEKS 5.3.B
7 Inferential	B. Answers will vary but should cite the text where Alice describes her lack of understanding of the material	TEKS 5.6.F; TEKS 5.7.C
8 Evaluative	First is informational, second is literary; Answers should include objective facts (for first), use of characters and narrative (for second)	TEKS 5.9.D.i
9 Evaluative	Answers should include objective facts/chemical content	TEKS 5.6.G; TEKS 5.7.C

<table>
<tr><td>10 Evaluative</td><td>
<table>
<tr><td>Concept</td><td>How it links to ice cream</td></tr>
<tr><td>Periodic table of elements</td><td>Chalkboard with ice cream flavors</td></tr>
<tr><td>Element</td><td>Ice cream flavor</td></tr>
<tr><td>Atom</td><td>Scoop</td></tr>
<tr><td>Molecule</td><td>Two scoops</td></tr>
<tr><td>Compound</td><td>Two scoops of different flavors</td></tr>
</table>
</td><td>TEKS 5.6.G; TEKS 5.6.H</td></tr>
<tr><td>11</td><td>Answers should combine the information on the chemical formula of salt with the explanation of elements and compounds to identify why salt is a compound.</td><td>TEKS 5.6.H; TEKS 5.12.B</td></tr>
<tr><td>12</td><td>Answers should combine information from both texts and background knowledge to identify
An element containing only one kind of bonded atom
A compound containing more than one kind of bonded atom
A solution containing non-bonded elements or compounds mixed together/dissolved</td><td>TEKS 5.6.H; TEKS 5.12.B</td></tr>
<tr><td>13</td><td>SEE WRITING PROMPT SCORING</td><td></td></tr>
</table>

Writing Prompt Scoring

The writing prompt addresses TEKS 5.7.C; TEKS 5.7.F; TEKS 5.11.D; TEKS 5.12.A; TEKS 5.12.B

Score	**4**	**3**	**2**	**1**
Criteria	Narrative contains two pieces of appropriate evidence from the text AND has clear narrative elements (e.g., fictional characters, setting and plot)	Narrative contains one piece of appropriate evidence from the text AND has clear narrative elements (e.g., fictional characters, setting and plot)	Narrative conveys information or conveys narrative but does not successfully combine the two	Narrative neither conveys information nor shows clear narrative elements

Please add an additional two points if students have correctly identified (i) facts and (ii) literary elements in the table provided.

Grammar Answer Key

1. Answers will vary but should include at least one adjective or adverb while maintaining the same meaning.
2. Answers are below:
   - I went into the ice cream parlor and the owner smiled at me.
   - I went into the ice cream parlor because I was hungry.
   - I went into the ice cream parlor but I walked right out again.
3. Answers will vary but examples are as follows:
   - Ice cream is soft and tingly on the tongue. I sigh with pleasure as I devour it.
   - Salt is a fascinating compound. It can be extracted in many ways. Some of these are from ancient times while some are more modern.
4. Answers are below with subject underlined and comma inserted:
   - To be first in line, <u>Alice</u> had to queue outside the parlor for a long time.
   - Realizing she was annoyed, <u>Trevor</u> let Alice finish her sentence.
   - Putting her hand in her pocket, <u>Alice</u> said "I'll buy this."
5. Answers are below:
   - You think I'm talking too much, don't you?
   - Yes, I suppose I do.
   - It wouldn't help if I taped my mouth shut, would it?
   - No, I don't think that's a good idea.
6. Answers are below:
   - I had been to the ice cream parlor before I learned about chemistry.
   - The seawater had evaporated before we extracted the salt.

Morphology Answer Key

1. achievement
2. disagreement
3. permission
4. admitted
5. mission

Lesson 15: Unit Assessment

Writing

15M

NARRATIVE BUILDING (15 MIN.)

- If students complete their assessment before the end of the lesson, ask them to continue to work on their narratives ("Amy's next case") in Activity Book 14.2
- If time permits, have students type their persuasive essay.

Activity Page 14.2

Grade 5 | Unit 8

Pausing Point

PAUSING POINT FOR DIFFERENTIATION OF INSTRUCTION

Please use the final four days of this unit to address results of the Unit Assessment (for reading comprehension, grammar and morphology). Use each student's scores on the Unit Assessment to determine which remediation and/or enrichment opportunities will benefit particular students. In assigning these remediation and/or enrichment activities, you may choose to have students work individually, in small groups, or as a whole class.

REMEDIATION

For a detailed description of remediation strategies, which address lagging skills in Reading Comprehension, Fluency, Language, and Writing, refer to the Program Guide.

Writing

Use time during the Pausing Point to revisit three sets of students' work. First, review students' integration of material for example in lessons 3,4,7, and 13. Second, review the student writing tasks in lesson 5 and lesson 10 (to the sheriff). Finally, review the work students have done so far on their narratives. (Lesson 14)

Pair students to share their work. Each student should give at least one compliment and ask at least one question. You may choose to work individually with students who would benefit from discussing areas in which improvement may be needed. You may wish to provide time for those students to revise and edit their work based on your discussion, and to publish their revised and edited draft onto a clean page.

You may wish to suggest that students needing more practice with their police reports or their letter to the sheriff write a new report or letter. Provide additional structure and guidance for students, making copies of the Rubrics found in the Teacher Resources of this Teacher Guide.

As a challenge, you may encourage students to write a new police report using the material in the second half of the reader.

ENRICHMENT

If students have mastered the content and skills in the Chemical Matter unit, their experience with the domain concepts may be enriched by the following activities:

- Students may read the enrichment selections contained in the Reader. "A Pioneering Chemist" describes the life of Percy Lavon Julian, an African American chemist who was a pioneer and set up his own lab. "Abundant, Amazing Aluminum" describes the extraordinary history and uses of this element. The Activity Book contains activity pages students can complete as they read these selections.
- We suggest that otherwise students use the Pausing Point days to continue working on their narratives ("Amy's Next Case"). As described in Lesson 14, students can supplement this by researching additional scientific material: some good choices may be the human body, geology, and space. There is material in the program sequence and in earlier grades to support this research.
- As students work on their narratives they should continue to use the plot diagram in Activity Page 14.1 to develop their story. They should also use the activity page provided in the Pausing Point section of their Activity Book to think about the characters' wants and resolution (which they investigated in this unit).
- As students develop their narrative, they should systematically seek peer review and comment, as they did in Lesson 14. They should then revise their work.
- Development of the narrative can continue beyond the Pausing Point days provided.
- Students may share, either with a small group or with the class, their narrative. You may also wish them to publish it in some form.

Grade 5 | Unit 8

Teacher Resources

In this section, you will find:

- Glossary
- Pages from Geology Reader
- Changes in State Diagrams
- Four Sample Character Maps
- Periodic Table
- Sample Police Reports
- Articles on Investigations
- Fossil Image Poster
- Rubric: Presentation Lesson 5
- Rubric: Presentation Lesson 9
- Rubric: Presentation Lesson 11
- Plot Diagram
- Narrative Rubric
- Activity Book Answer Key
- Texas Essential Knowledge and Skills Correlation Chart
- English Language Proficiency Standards Correlation Chart

Grade 5 | Unit 8

Glossary

A

appreciate, v. recognize the worth of

atom, n. the basic unit of an element

B

barren, adj. bleak and lifeless

blazing, adj. very hot

bond, v. in chemistry, an attraction between atoms that allows chemical substances to be formed

boundaries, n. the limits of an area

C

cells, n. the basic building blocks of living things

chemistry, n. the science of matter

condense, v. to change from a gas to a liquid

conductor, n. a good channel for something (like electricity)

D

decompose, n. decay

devour, v. eat fast and hungrily

discovery, n. the act of finding something new or unexpected

dissolve, v. to turn into a solution

E

embed, v. fixed deeply into the surrounding mass

encased, v. completely surrounded

eureka, (exclamation) Ancient Greek meaning "I have found it!"

evaporate, v. turn from liquid into vapor

expert, n. someone who has deep knowledge and skill in an area, usually from long experience and study

expose, v. make something visible by uncovering it

F

fluffy, adj. light texture; filled with air

flushed, adj. with a reddish color (usually the face)

fragment, n. small part broken off something

furnace, n. a very hot oven

G

genuinely, adv. honestly, authentically

gesture, n. a movement, usually of the hand or head, to express meaning or point to something.

glossy, adj. shiny and smooth

H

horizon, n. where the earth seems to meet the sky

hunch, n. a guess based on feelings, not facts

I

incredulous, adj. disbelieving

intention, n. aim or plan

J

juvenile, n. a young creature or person

L

lurch, v. to make a sudden, unsteady movement

M

mammal, n. a type of animal (Humans are mammals.)

mass, n. the amount of matter in a substance or object

matter, n. any substance that occupies space and has mass

mixture, n. two or more substances that are combined without changing their chemical composition

molecule, n. a group of atoms bonded together

mutter, v. to say something in a low or hard-to-hear voice, often with annoyance

N

nudge, v. to gently touch or push

P

paleontology, n. the science of fossils

periodic table, n. a way of organizing chemical elements

photosynthesis, n. process by which plants use sunlight to get food from water and carbon dioxide

plateau, n. an area of high, level (no slope) ground

portable, adj. easy to carry

precisely, adv. exactly; with complete accuracy

prod, v. to poke someone or something

pry, v. use force to open

R

ramble, v. walk without any obvious purpose

reluctant, adj. unwilling

resonance, n. a quality of sound: clear, deep, long lasting

S

sandwich, v. to squash between two things

shimmer, v. to shine with a light that seems to move a little

slather, v. spread on thickly

slithering, v. sliding along

sliver, n. thin, narrow piece

spangled, v. covered with small, shiny objects

suspicious, adj. giving the impression of dishonest behavior

T

tarnishing, v. a process by which some metals become dull

technique, n. a way of doing something, usually with some skill

tense, adj. nervous, tightly wound

trace, n. a slight mark

U

undergoing, v. experiencing

unscrupulous, adj. not caring about the right thing to do

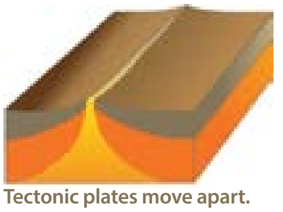
V

visible, adj. able to be seen

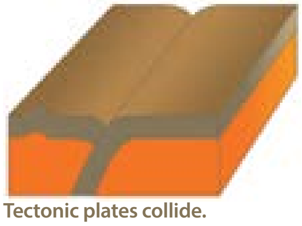
W

weaving, v. moving back and forth

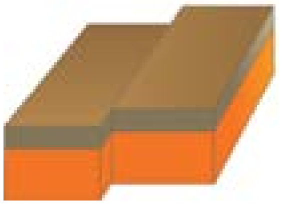
A Matter of Time


Tectonic plates move apart.

At some boundaries, tectonic plates are moving apart. As the plates separate, molten rock flows up from the mantle into the space between them, creating new crust. Mid-ocean ridges are an example of this type of plate interaction. Tectonic plates along the mid-ocean ridge in the Atlantic Ocean are moving apart at a rate of about 0.8 to 2 inches per year. That may not seem like much, but it adds up. Two hundred million years ago, the landmasses of North America and Europe were joined. So were South America and Africa. Thanks to separating plates, these continents now lie on opposite sides of a vast ocean.


Tectonic plates collide.

At other plate boundaries, tectonic plates are colliding, or crashing together. In some places, colliding plates slowly crash into each other. The crust at their edges gradually crumples and is pushed higher and higher, creating mountains. In other places, one of the colliding plates slides under the other. Two plates are colliding this way along the western coast of South America. A heavier oceanic plate is sliding under a lighter continental plate. Scientists call this process subduction. Subduction has created a deep ocean trench off the coast of Chile and Peru. It has also had a role in creating the towering Andes Mountains along the western edge of South America. Similar plate interactions have formed mountain ranges throughout Earth's long history.


Tectonic plates slide sideways past one another.

Finally, tectonic plates slide sideways past one another. It's never a smooth process. Plate edges press together hard. They often get stuck while the

20

pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Wegener's Pangaea broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.

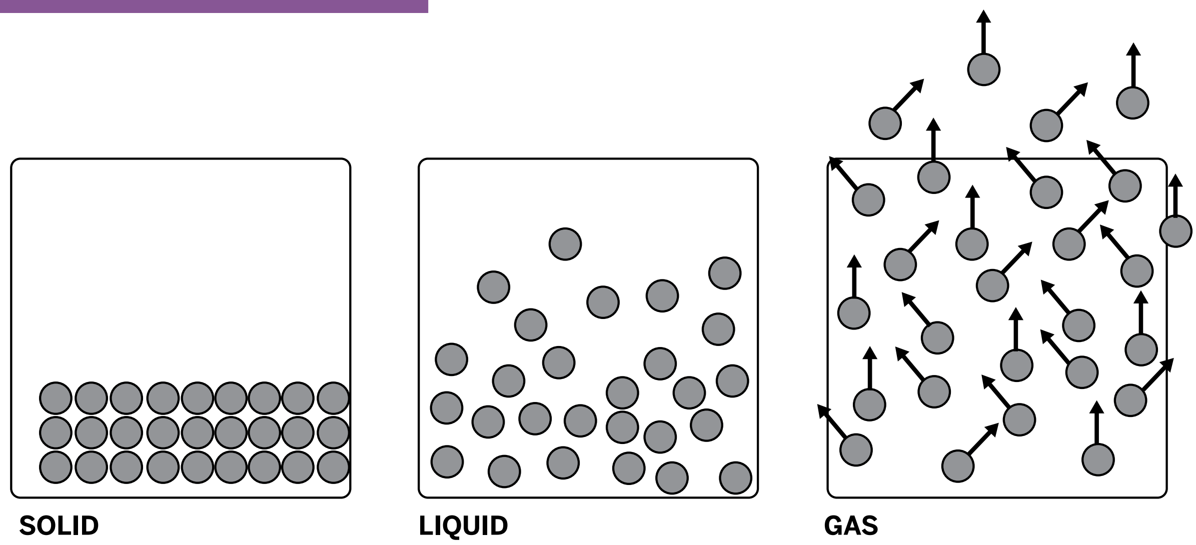
As plates move, interesting things happen. Most of the time, they happen incredibly slowly. Sometimes, though, the effects of plate movements are sudden and dramatic. Think earthquakes and volcanoes!

Core Conclusions

You may never have heard of the Danish scientist Inge Lehmann. Among seismologists, however, she is famous. Around 1900, scientists thought the earth had just three layers: an outer crust, a solid mantle, and a liquid core. Lehmann studied seismograph records of earthquakes. She analyzed how seismic waves changed as they traveled through Earth's interior. Lehmann collected thousands of records organized in boxes—there were no computers back then! She saw patterns in how seismic waves behaved as they moved through Earth. Lehmann concluded that Earth's core has two parts: a liquid outer core and a solid inner core. In 1936, she announced her findings and changed our view of Earth!

21

CHANGES IN STATE DIAGRAMS



FOUR SAMPLE CHARACTER MAPS

Character Map 1

Matt

Character Traits and Observations

- Makes friends easily
- Loves chemistry and palentology

Says and Does

- Drives to camp with Tess and Amy
- Excavates dinosaur with Amy

Relationship with Other Characters

- Amy's brother
- Talked Amy into going to Fossil Camp

Motivations/Wants

- Wants to go to Fossil Camp
- Wants to make an important discovery

Character Map 2

	What He Says or Does	What We Learn About His 'Wants'	What We Learn About His Character	What Else We Learn
Chapter 1	• Drives to fossil camp • Arrives at camp and joins everyone in lab	• Wants to be at fossil camp • Wants to make an important discovery	• Makes friends easily • Doesnt mind heat/bugs dirt	• Amy's brother • He talked Amy and parents into going to fossil camp • Thinks camp is 'cool'
Chapter 2	• Excavates jawbone with Amy • Does dishes later that eveningv			• Asks 'excellent question' about chemistry
Chapter 3				

Character Map 3

Tess

- Asks 'excellent' questions

Amy(Matt's sister)

- Persuades to go to fossil camp
- Excavates dinosaur with

Matt

- Makes friends easily
- Doesn't mind heat/bugs/dirt

Fossil Camp

- Thinks 'cool'
- Does the dishes

Julian

- Both want to make important discovery
- Shares tent with

Felix

- Shares tent with

Character Map 4

Matt

Matt is Amy's brother. He persuaded Amy to go to fossil camp and his parents to allow them to go. He hopes to make an important discovery. He makes friends easily and doesn't mind heat, dirt, or bugs. He thinks the camp is "cool." He has a "glow of excitement" about going to the dig site.

At the dig site, Matt excavates a jawbone with Amy. When they take a break, he asks 'excellent' questions of Tess about states of matter. Later that night he does the dishes.

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

***** *The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

SAMPLE POLICE REPORTS

Sample 1

Incident type: reported robbery

Address: 433 Smith Street

Witnesses: Mrs. Elena Baria

Evidence: fingerprints (on counter)

This morning at 10 a.m. there was a reported robbery on the corner of Smith and Jones Street. Mrs. Baria, aged 53, called the police after seeing a man run out of the grocery store.

I arrived at the scene at 11:15 a.m. and spoke with Mrs. Baria. She told me:

1. There was glass all over the street when she turned the corner from the grocery store window. (I checked this and there was glass on the pavement.)
2. She saw a man who "looked suspicious" and was running fast out of the grocery store.
3. She could not describe the height or appearance of the suspect. She thought he was wearing a mask, but she could not be sure at that distance.

There was no CCTV footage of the event. We have found fingerprints on the counter of the grocery store. Further analysis is needed to determine if the fingerprints belong to the shopkeeper and his assistant or another.

The shopkeeper, Mr. Thompson, was not present, but we interviewed him later that day. He claimed that yesterday a large amount of money had been stolen. He also reported that his assistant was the only other person who was aware of the money. We have not been able to contact or locate the assistant and will continue to try.

Mr. Thompson reported that on the previous day:

1. He and his assistant arrived at the store with the money at 3 p.m. His assistant went into the back to compile inventory.
2. Mr. Thompson, at this time, put the money into the safe.
3. At 3:30 p.m. he and his assistant worked as usual in the store until 5:30 p.m. His assistant then left for the day.
4. Mr. Thompson left the store at 7 p.m. and went straight home. He locked the store as usual. His assistant does not have a key, he says.

Sample 2

Date: 1/1/2015

Day: Monday

Time: 11:15 a.m.

Officer on Duty: Inspector Ravitz

Location: 42 Hubbard Avenue

Nature of report: police information

This officer was on duty and patrolling when he was alerted by radio to a missing person report in the nearby area. He drove straight to the named house, arriving at 11:15 a.m. There he met Melissa Mulan, who had filed the report and was worried about the disappearance of her boyfriend, Jesus. Melissa is 28 and works full time in retail, and has been with her boyfriend for two and a half years. He was last seen the previous evening and had been due to arrive at her apartment that morning and then go on a picnic.

I asked for their movements the previous day. Melissa had met her boyfriend for dinner with her parents at 7 p.m. the previous evening at the Italian restaurant Da Loca. They had dinner, and Melissa accompanied her parents back to their home. She stayed for one cup of coffee. Jesus, she believes, would have returned to his apartment. She said he sometimes picks up documents from work late to carry on working at home.

Initially Mulan told me she could think of no reason for his non-appearance this morning. On further conversation, however, it emerged that they had a serious argument the night before. It also emerged that on previous occasions her boyfriend had taken a day or two to "cool off" after an argument.

I will check with Jesus's closest friends and family and then advise waiting several hours before further investigation.

ARTICLES ON INVESTIGATIONS

Article 1.

What is the investigation process? (The Metropolitan Police—the police force of London)

1. **Initial investigation—**This will involve a review of witnesses, scenes, and all other available evidence.

2. **Investigative assessment—**After the initial investigation, a decision will be made whether to transfer the crime to an investigating officer for further investigation or not. This assessment will take into account the following:

- Seriousness of the offence
- Likelihood of solvability (for example, availability of evidence)
- Level of resources required proportionate to the seriousness of the offence

There are two possible outcomes at this point:

a) Investigation will be closed.

b) Crime will be transferred for further investigation.

3. **Further investigation—**If the crime is transferred for further investigation, this will include:

- Taking statements from the victim and any witnesses
- Arresting and detaining any identified suspects and formally interviewing them at a police station
- At the end of the investigation there are three possible outcomes for the suspect(s).

a) Charged—The suspect is told that he or she will be sent to court and what law he or she is alleged to have broken.

b) Cautioned—An official warning is given in some circumstances.

c) No further action—If there is insufficient evidence to charge or caution a suspect, no further action will be taken.

Article 2.

Preventing crime better than catching offenders

(telegraph.co.uk/news/politics/10025018/Preventing-crime-better-than-catching-offenders-says-chief-inspector.html)

Published: 29 April 2013

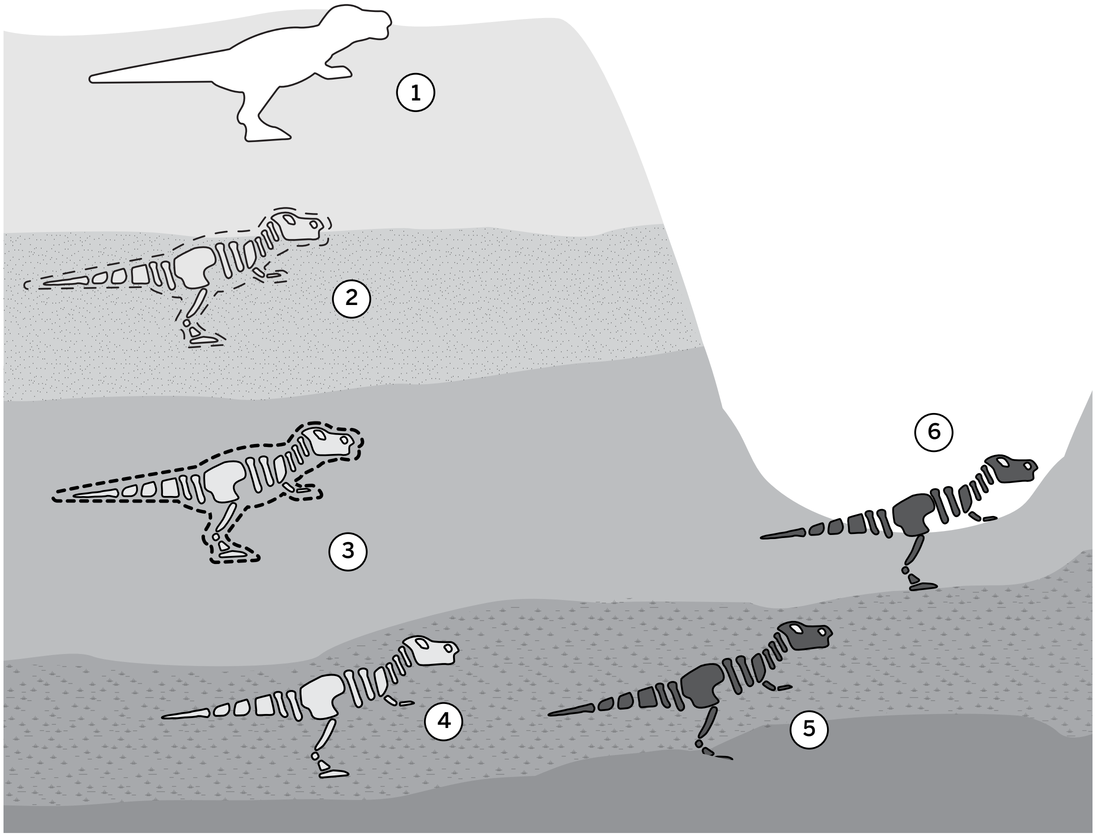
Tom Windsor, the chief inspector of constabulary for England and Wales, suggested police forces would get "more bang for their buck" if they focus on prevention rather than cure . . .

Mr Windsor . . . said the "primary purpose" of police is crime prevention.

"Sir Robert Peel, who founded the modern police service in 1829 said the primary test of police efficiency is the absence of crime and disorder," he said.

"If we can prevent offences taking place and we prevent there being any victims, which is absolutely critical, and also if we save all of those costs."

FOSSIL IMAGE POSTER



RUBRIC: PRESENTATION LESSON 5

	Police Officer 1 (Name: ___) Arguing for an Investigation	**Police Officer 2 (Name: ___)** Arguing against an Investigation
Was the person speaking clearly and maintaining eye contact?	(Y/N)	(Y/N)
Did he or she use evidence from the text in the argument? How many pieces?	(Y/N) Number:	(Y/N) Number:
Did he or she use evidence from the other articles in the other resources?	(Y/N)	(Y/N)
Did he or she use other techniques—stories, for example—that made the argument more compelling?	(Y/N) Please give details:	(Y/N) Please give details:

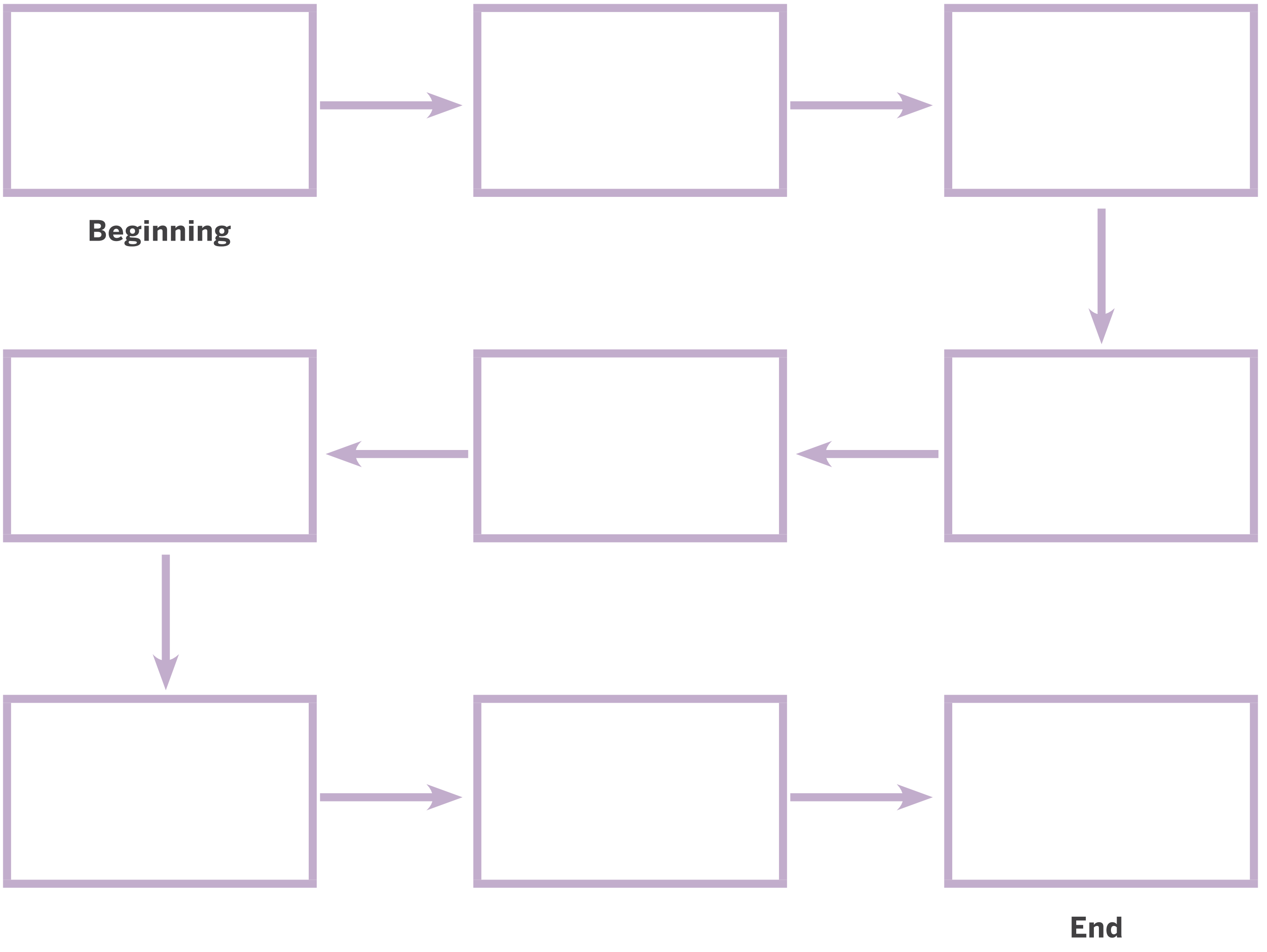
RUBRIC: PRESENTATION LESSON 9

	Characters being presented: Name of student:	Characters being presented: Name of student:	Characters being presented: Name of student:
Was the person speaking clearly and maintaining eye contact?	(Y/N)	(Y/N)	(Y/N)
Did he or she introduce the character clearly, using information from the text?	(Y/N) Details:	(Y/N) Details:	(Y/N) Details:
Did he or she identify objective information about the character?	(Y/N) Details:	(Y/N) Details:	(Y/N) Details:
Did he or she use that evidence to explain whether the character was a likely suspect?	(Y/N) Details:	(Y/N) Details:	(Y/N) Details:
Did he or she identify subjective information about the character?	(Y/N) Details:	(Y/N) Details:	(Y/N) Details:
Was it clear when evidence was subjective and when it was objective?	(Y/N) Details:	(Y/N) Details:	(Y/N) Details:
Was it clear what the presenter would like to find out next about the character? **Did this link to his or her evidence?**	(Y/N) Details: (Y/N) Details:	(Y/N) Details: (Y/N) Details:	(Y/N) Details: (Y/N) Details:

RUBRIC: PRESENTATION LESSON 11

	Name of suspect accused: Students in small group:
Was the group speaking clearly and maintaining eye contact?	(Y/N)
Did they clearly state who they were accusing?	(Y/N)
Did they identify a clear motive, using evidence from the text?	(Y/N) Details:
Did they explain how the suspect had the means to commit the crime, using evidence from the text?	(Y/N) Details:
Did they explain how the suspect had the opportunity to commit the crime, using evidence from the text?	(Y/N) Details:
Was it clear when evidence was subjective and when it was objective?	(Y/N) Details:
Do you think the evidence was convincing? Why or why not?	(Y/N) Details:

PLOT DIAGRAM



NARRATIVE RUBRIC

Writing Rubric—Lesson 2

	Exemplary	Strong	Developing	Beginning
Characteristics of Text	Student has clearly identified and used a range of literary characteristics and changed informational text into a literary text.	Student has changed text substantially, identifying and using literary characteristics and not informational characteristics.	Student has presented text with incomplete change and reflection of literary characteristics.	Student has presented informational text with little change or reflection of literary characteristics.
Content	Content is clearly expressed and accurate.	Content is mostly clearly expressed and accurate.	Some content is clearly expressed, but there are inaccuracies or ambiguities.	Little or no content is clearly expressed or accurate.
Selection of Content	Clear discrimination about content to include.	Some discrimination about content to include.	Some discrimination but with some passages copied or poorly transferred.	Little to no discrimination about content to include.
Setting, Characters, and Plot	Clear setting, characters, and plot with descriptive details.	Clear setting, characters, and plot with few or no descriptive details.	Some attempt to place story in setting or establish characters, but result is ambiguous or confused; no descriptive details.	Little to no attempt to establish setting, characters, plot.
Organization	Content is clearly organized and linear.	Content is mostly clearly organized.	Some attempt at content organization has been made.	Little or no attempt at content organization has been made.

Writing Rubric—Lesson 5

Police Report

	Exemplary	**Strong**	**Developing**	**Beginning**
Summary of Events	Student has clearly mapped from information in the Reader and summary chart to report. He or she has selected pertinent information.	Student has clearly mapped from information in the Reader and summary chart to report. Some information is redundant.	Student has done some mapping from information in the Reader and summary chart to report. Choice of information is not clear.	Student has done little to no mapping from information in the Reader and summary chart to report. No obvious choice of information.
Organization	Student has clearly used information from sample reports to decide how to organize text. Text is clear and coherent.	Student has used information from sample reports to decide how to organize text. Text is mostly clear and coherent.	Student has made some attempt at organizing text, but result is not systematically clear or coherent.	Text is unclear with little obvious organization.
Objectivity	Student has stated facts about characters.	Student has mostly stated facts about characters.	There is some confusion between fact and opinion.	Statements about characters, and their objectivity, are unclear.

Writing Rubric—Lesson 10

Letter to Sheriff

	Exemplary	Strong	Developing	Beginning
Understanding of Content	Student has clearly understood plan and can distinguish between the phases.	Student has mostly understood plan and can distinguish between the phases.	Student shows some understanding of the chemical content in the plan.	Student shows little or no understanding of the chemical content in the plan.
Tone	Student has clearly considered the audience and explained content as if to a layperson. He or she has addressed the sheriff appropriately.	Student has considered the audience and explained content with some reflection of a layperson. He or she has made some attempt to show the sheriff appropriately.	Student has made some attempt to convey content to an audience.	Student has made little or no attempt to convey content to an audience.
Objectivity	Student has made a clear distinction between subjective and objective information.	Student mostly shows understanding of subjective and objective information.	Student shows some understanding of subjective and objective information.	Student shows little or no understanding of subjective and objective information.
Conclusion	Student has given a clear conclusion to the letter with an appropriate ending.	Student has given a clear conclusion to the letter.	Student has given some indication that letter is concluding.	Student has provided no clear conclusion to the letter.

Digital Exit Ticket Suggested Answers	
QUESTION	ANSWER
Lesson 1	
What is the setting of the story in Chapter 1 of the Reader? What information did the author share about Amy's environment?	Answers may vary, but may include: • The Badlands of eastern Montana, Fossil Camp or the Campsite. • The author shared details including : it's hot (100 degrees); Amy is in eastern Montana; there are "barren ridges of rock towering over gullies and patches of stiff prairie grass;" there are potholes in the road.
Lesson 2	
Identify a clue from Chapter 2 of the Reader that describes how Amy feels uncomfortably hot. Is this a literary or informational detail of the text? Explain your response.	Answers may vary but may include that Amy "edges toward" the one square of shade because she is still uncomfortably hot. This is a literary detail of the text.
Lesson 3	
What does all matter have in common? What two factors does Tess say decide whether matter is a solid, a liquid, or a gas state? Use evidence from the text to support your response.	• All matter is made up of small particles. • The state of matter depends on how tightly packed these particles are, and how much energy they have.
Lesson 4	
Name and describe at least three characteristics of metals that you read in the chapter.	Answers may vary, but may include: resonance, conductors of electricity and heat, shiny, malleable and ductile.
Lesson 5	
After hearing the debate, do you believe the sheriff should investigate the missing fossil or not? Use evidence from the text to support your response.	Answers will vary.
Lesson 6	
What new information did you learn about Julian and Kristal? What did you add to your character map?	• Julian is disappointed when he finds fool's gold because he wants to make his dad proud. • Kristal knows about the missing fossil because she has sketched it. • Character map details will vary.
Lesson 7	
Using evidence from the chapter, explain how a mixture is different from a solution or a compound.	• A mixture is made from two or more substances that are physically mixed together but can still be separated. • A solution is formed when one substance is mixed into another and dissolves. • A compound is a molecule that contains atoms of two or more different elements.

Lesson 8	
After reading the first part of Chapter 6 in the Reader, who are the two new suspects? What information did you add to your character map?	The two new suspects are the people in the black SUV and Julian. Answers may vary for the character map.
Lesson 9	
Imagine that you left some water in a glass outside on a hot day. When you went to fetch it, half the water was gone. Is that a physical or chemical change? Explain your answer.	Evaporation is a physical change in matter--a change in states. Physical change may alter some properties or the physical appearance of a substance, but it doesn't change what the substance is made of--the chemical composition.
Lesson 10	
In your opinion, what piece of evidence from the first part of Chapter 7 in the Reader is the strongest? What makes it so strong?	Answers will vary.
Lesson 11	
Who did you identify as the culprit? What evidence did you use to identify the suspect as guilty?	Answers will vary.
Lesson 12	
Which of the four characters (Darla, Felix, the squirrels, or the SUV) have "wants" that might have led them to take the fossils? Explain your opinion using evidence from the text.	Answers will vary but would not include the SUV driver or the squirrels.
Lesson 13	
Explain how recycling is a chemical process. Use evidence from the text to support your answer.	Answers may vary but should include: Chemical changes recycle by combining the same elements over and over in different combinations to form new types of matter.
Lesson 14	
What is the plot of your new detective story with Amy? What scientific content will you include?	Answers will vary.

ACTIVITY BOOK ANSWER KEY

ACTIVITY 1.1

NAME: ______________________ DATE: __________

WELCOME TO FOSSIL CAMP

Working individually, answer the questions below in the space provided.

1. Below are three images. Which of these is closest to the setting described in the text? Provide quotes from the text to support your answer.

This image is closest to setting in text. It shows "barren ridges of weathered rock" and "patches of stiff prairie grass". (The other images only show one of these.)

ACTIVITY 1.1

NAME: ______________________ DATE: __________

2. **Look at the sentences below.** Circle those that you think describe the setting of this text. In each case, provide a word or term in the text that supports your answer.

"Lonely and empty"

"An extraordinary edifice made by man"

"Shaped by rain and storms"

"Chains of rocky hills that have almost no plants or life on them"

"Lush and green"

Challenge

1. The badlands are the setting for this story. Does that mean the tents are not the setting? Give reasons for your answer.

   Answers should recognize that both are the setting for the story, because a) different parts of the action happen in the two locations; and b) the tents are in the Badlands.

2. Why do you think the text spends so much time describing the setting? What effect does that have on you, the reader?

ACTIVITY PAGE 1.2

NAME: ______________________ DATE: __________

VOCABULARY

Working as a class, complete the table below, using Chapter 1 of the *The Badlands Sleuth* for your answers.

TERM OR IDEA	DEFINITION OR EXPLANATION
Matter	anything that has mass or takes up space
States of Matter	Matter can be in different states: solid, liquid, or gas.
Physical Property	anything you can see, touch, taste, or smell; something you can measure
Mass	the amount of matter in a substance or object

ACTIVITY PAGE 1.2

NAME: ______________________ DATE: __________

EXAMPLES FROM TEXT	OTHER EXAMPLES
A fossil claw	(Answers may vary.)
Solid: claw Liquid: water Gas: air	(Answers may vary.)
Texture: smooth Shape: curved Color: dark brown Mass: 113.4 grams	(Students should explore the examples they used above.)
The mass of the fossil claw is 113.4 grams.	(Students should explore the examples they used above.)

ACTIVITY PAGE 1.3

NAME: DATE:

Think of an object that qualifies as matter. Using the table you created in Activity Page 1.2 as a guide, describe the properties of the object, just as a scientist would. But don't name or identify the object! As you write, think about how to organize your information.

Answers will vary but should show a) precise description of the object; b) a recognition of physical properties (e.g. color, shape, texture). The answer may include the state of matter (liquid, gas, solid). Students should not identify the object by name.

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ACTIVITY PAGE 2.1

NAME: DATE:

Look again at the second half of Chapter 1 of *The Badlands Sleuth*. In your pairs, compare this text with the Geology text and provide reasons why you might consider *The Badlands Sleuth* text either informational or literary. Give specific examples in your answer.

Reasons the Text Is Informational Like the Geology Text

Like the Geology text, it: Answers for both may include: presents factual content; presents information concisely without lots of descriptive language; intent is to explain and inform.

For example:

Unlike the first half of Chapter 1 of *The Badlands Sleuth*, it:

Answers for both may include: presents factual content; presents information concisely without lots of descriptive language; intent is to explain and inform.

For example:

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ACTIVITY PAGE 2.1

NAME: DATE:

Reasons the Text Is Literary Like the First Half of the Chapter

Like the first half of the chapter, it: Answers for both may include: has continuous prose; continues with imaginary characters and plot; does not have clear headings and diagrams to explain the material; uses questions from fictional characters to prompt the information.

For example:

Unlike the Geology text, it: Answers for both may include: has continuous prose; continues with imaginary characters and plot; does not have clear headings and diagrams to explain the material; uses questions from fictional characters to prompt the information.

For example:

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ACTIVITY PAGE 2.1

NAME: DATE:

Which Is It?

Do you think this text should be classed as narrative or informational? Use your examples above to provide an answer. (If you disagree with your partner, it is OK for you to write something different.)

Answers will vary but should reflect characteristics of either informational or literary text.

Chemical Matter | Activity Book 13

ACTIVITY PAGE 2.2

NAME: _______________ DATE: _______

Please see Writing Rubric in Teacher Resources on this Activity for guidance.

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ACTIVITY 2.3

NAME: _______________ DATE: _______

EXPAND THE SENTENCES

Expand the sentences below. Think about descriptive details you can add, and what additional information they will provide the reader. You might want to brainstorm some adjectives first. Remember, you should still have only one sentence at the end.

1. Amy walked into her tent
   Answers will vary but should include uses of adjectives and adverbs, e.g., "Amy warily walked into her black and spooky tent."

2. Matt listened to Tess's explanation
   Answers will vary but should include uses of adjectives and adverbs, e.g., "Matt eagerly listened to Tess's fascinating explanation."

3. I drove round the rocks
   Answers will vary but should include uses of adjectives and adverbs, e.g., "I wearily drove round the barren, lonely rocks."

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ACTIVITY 2.4

NAME: _______________ DATE: _______

–ment: Suffix Meaning State Of Being

Choose the correct word and combine it with the suffix *–ment* to complete the sentence.

1. Winning the Nobel Prize was a great achievement.
   (amaze, achieve, align, excite)
2. The idea of finding a new fossil caused great excitement.
   (disagree, judge, entertain, excite)
3. After 45 years of work, Mr. Smith was looking forward to retirement.
   (pay, accomplish, move, retire)
4. I want to be a police officer because I'm interested in law enforcement.
   (endear, encourage, enforce, entertain)
5. With a glow of excitement in his eyes, Matt ran down the beach.
   (achieve, align, excite, entertain)

Challenge:
Write three sentences using a word with the suffix *–ment*. They can be about anything!

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ACTIVITY 2.5

NAME: _______________ DATE: _______

ANALYZE DETAILS

In pairs, answer the questions below. After answering each question, say whether you think the text detail is literary or informational, and why.

Question	Answer	Is this a literary or informational detail? Give reasons for your answer.
What series of steps are required to excavate the bones?	1. Use a hammer and chisel to break apart big chunks of rock. 2. Once the bones are exposed, use picks to scrape away more rock. 3. Use a brush every few minutes to clear the area.	Informational: it provides clear information on the steps necessary for a technical process.
What clue do you get about Julian's personality from his questions?	He badly wants to be "famous" like his father and brother.	Literary: this gives details and clues about one of the literary characters.
Why does Daria say she wants her phone, and why does she really want it?	She says she wants it to call her friends, but really it's because she misses her mom.	Literary: this gives details and clues about one of the literary characters.

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ACTIVITY 3.1

NAME: ______________________ DATE: ____________

Can you be a dinosaur detective?

Read the clues below and see if you can decipher the origin of the dinosaur's name.

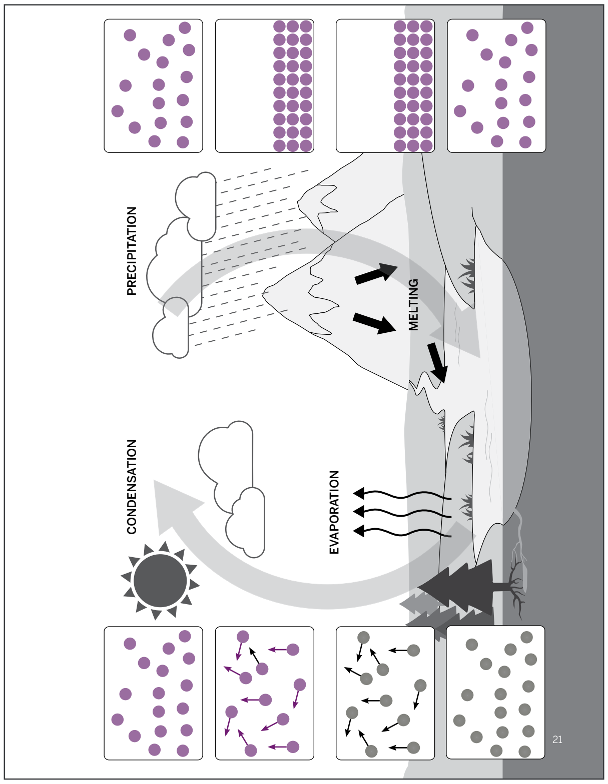
- Acheroraptor temertyorum was found in Hell's Creek in Montana.
- In Greek mythology, there is a river in the underworld called Acheron. The Greeks did not have hell–but they did have the underworld, where people were punished or rewarded depending on their lives.
- Raptor comes from the Latin word raptere, which means "to plunder or steal."
- James and Louise Temerty have been major supporters of the University of Ontario, where the dinosaur is displayed.
- Sometimes paleontologists, or those who supported or funded their work, get new fossils named after them.

My Theory

1. They used the name **Acheroraptor** because
   Answers will vary but should reference the name Hell's Creek and the river in the underworld (Greek version of hell).

2. They used the name **temertyorum** because
   Answers will vary but should reference the Temerty family and their support.

Chemical Matter | Activity Book 19



ACTIVITY 4.1

NAME: ______________________ DATE: ____________

As you read Chapter 4 in your pairs, one of you should answer the Detective questions below, and the other the Scientist questions. When you have finished, explain and discuss your answers with your partner.

Detective Questions:

1. What are we told about Dr. Forester that indicates she isn't "very happy"?
   She is gesturing and shaking her head.

2. What did Kristal do that indicated she was "secretive" about her drawings?
   She pulled her notepad against her chest so Amy couldn't see the drawings.

3. What further evidence do we have that Dr. Forester is upset?
   She picks up her coffee but then doesn't drink from it.

Challenge: Why does this suggest she is upset?

4. What information have we been given about Amy that tell us why she "tingles" when she hears the word *mystery*?
   Answers will vary, but should reference her interest in detectives (and not fossils).

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ACTIVITY PAGE 4.1

NAME: ______________________ DATE: ____________

SCIENTIST QUESTIONS:

1. How was matter defined in earlier chapters?
   All the "stuff" of the universe: anything that has mass and takes up space.

SUPPORT:
The answer is in the second half of Chapter 1.

2. How has Tess added to the definition of matter?
   She says that all matter is made up of small particles called atoms.

3. What are different kinds of atoms called?
   Elements

4. How do scientists arrange the elements?
   Using the periodic table.

Chemical Matter | Activity Book 41

ACTIVITY PAGE 4.2

NAME: ________________________ DATE: ____________

PART 1.

Working in your small groups, find each of the elements mentioned by Tess on page 26 of the Reader in the periodic table. Note down their chemical symbols and circle them in the periodic table below.

Periodic Table of the Elements

Key
relative atomic mass atomic symbol name atomic (proton) number

1
H
hydrogen
1

1	2											3	4	5	6	7	0
																	4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.*
The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

ACTIVITY PAGE 4.2

NAME: ________________________ DATE: ____________

PART 2.

Now read the text again carefully and list the differences between metals and nonmetals that Tess describes. The first example has been completed for you.

METALS	NONMETALS
Resonant: *make a ringing sound*	***Nonresonant:*** *don't make a ringing sound*
Malleable: can be hammered into shapes	**Nonmalleable:** tend to break or crumble when hammered
Ductile: can be pulled into a wire and conduct electricity	**Nonductile:** hard to pull into a wire and conduct electricity
Conductors: conduct electricity	**Poor conductors**
Shiny	**Dull**

ACTIVITY PAGE 4.2

NAME: ________________________ DATE: ____________

PART 3.

Now read the descriptions of the elements below. Find the elements in the periodic table, and label whether you think they are metals or nonmetals from the descriptions in the text.

1. My little brother stole my mom's gold wedding ring while she was washing up. Next thing I knew, he was pounding it flat with a rock in the back garden! There was mud all over it, so it wasn't as shiny as normal. I managed to rescue it and take it back to her. It made a sad clinking sound when I placed it on the counter.

   Name of the element: **gold**

   Characteristics described: **malleable, shiny, resonant**

   Metal or nonmetal? **metal**

2. Carbon is one of the most amazing elements: it is the source of all life on our planet. But it doesn't look like much. It's dark and dull, and crumbles when you press it too hard. You can't make it into shapes or wires.

   Name of the element: **carbon**

   Characteristics described: **dull, nonmalleable, nonductile**

   Metal or nonmetal? **nonmetal**

ACTIVITY PAGE 4.2

NAME: ______ DATE: ______

3. When you peel back the plastic, you can see the shiny brown wire underneath, glistening in the light. It's amazing that something so thin makes all of our lights, and the toaster, and other things in the house work. Apparently the wire is made of copper, which was discovered 11,000 years ago. I don't know why we don't make more jewelry out of it–it's so pretty.

   Name of the element: copper

   Characteristics described: shiny, ductile, good conductor

   Metal or nonmetal? metal

4. Sulfur is not my favorite element. When it reacts it releases a horrible rotten-egg smell. As a solid, it's yellow and brittle. It doesn't make a nice sound when you hit it (in fact, it crumbles).

   Name of the element: sulfur

   Characteristics described: nonmalleable, nonresonant

   Metal or nonmetal? nonmetal

CHALLENGE:

Can you come up with your own examples from elements you recognize in the periodic table?

ACTIVITY 4.3

NAME: ______ DATE: ______

COMBINE SENTENCES

Combine the following sentences:

1. The dinosaur roared. It started running toward us.
   The dinosaur roared **as/and** it started running toward us.

2. Amy was careful when lifting the egg from the dig. The egg was many thousands of years old.
   Amy was careful when lifting the egg from the dig **because** the egg was many thousands of years old.

3. Amy might have looked bored. She was really excited.
   Amy might have looked bored, **but/however** she was really excited.

ACTIVITY 4.3

NAME: ______ DATE: ______

Reduce the following sentences:

1. The fox, which was quick and colored brown, jumped over the dog, which was lazy and didn't bother to get up.
   The quick fox was brown. It jumped over the lazy dog, which didn't bother to get up.

2. The pizza, cold and clammy to the touch, made Felix grimace when he ate it.
   The pizza was cold and clammy to the touch. It made Felix grimace when he ate it.

ACTIVITY 4.4

NAME: ______ DATE: ______

SUMMARIZING EVENTS

The Sheriff has heard some tales of strange happenings at the dig site and asked one of his junior policemen to compile a report to see if there's anything worth investigating.

Your job is to summarize the events that have befallen the campers so far, making particular note of who did what, and went where.

Your teacher will model taking notes to summarize the events for your police report from the first day for the campers. As she works, write notes with her in the space below.

When	Who	Where
Day 1–on the way to camp	Matt, Amy, Tess	in car driving to camp
Day 1–on the way to camp		arriving at campsite
Day 1–at the camp	Amy, Daria, Kristal	moving to tent
Day 1–at the camp	everyone: Matt, Amy, Tess, Daria, Kristal, Felix, Julian, Dr. Forester	moving to lab tent
Day 1–at the dig site	everyone	moving to dig site

ACTIVITY 4.4

NAME: DATE:

Description	Incidents?
Hot environment: badlands of eastern Montana; Potholes in road.	
cluster of tents in shadow of high, barren ridge	met by other campers and Dr. Forester
One tent; Amy in bed near the door.	(Kristal has notebook–relevant?)
Big canvas tent with awning outside; inside is a long table with instruments, boxes, and small cloth bags.	Introduced to fossils; Kristal sketches them.

ACTIVITY 4.4

NAME: DATE:

EVENTS

Now complete the table for Chapter 2 in your pairs. One of you will complete the first half of the table, and the other the second half of the table.

Partner 1

When	Who	Where
Chapter 2—at the dig site	everyone	dig site
	everyone	far end of dig site
	Felix	gully
	Dr. Forester	gully
	Dr. Forester	lab tent

ACTIVITY 4.4

NAME: DATE:

Description	Incidents?
Narrow plateau halfway up a ridge; exposed to the sun.	Partners excavate together, under Dr. Forester and Tess's supervision. Julian asks how to become famous.
Ridge forms a wall high enough to create a patch of shade.	Eat a snack. Discuss chemistry.
One tent; Amy in bed near the door.	Ledge gives way; Felix falls into gully, discovers fossil.
Big canvas tent with awning outside; inside is a long table with instruments, boxes, and small cloth bags.	Dr. Forester discovers "several" more bones.
	stays in lab looking at bones

ACTIVITY 4.4

NAME: DATE:

Partner 2

When	Who	Where
	Amy and Julian and Tess	kitchen tent
	Kristal and Matt	kitchen tent?
	Tess	campsite
	Everyone	campsite
	Amy, Kristal, Daria	tent

ACTIVITY 4.4

NAME: ______________ DATE: ______________

Description	Incidents?
	help make spaghetti
	do dishes after dinner
	builds fire
	Discuss chemistry around bonfire. Julian asks to see fossils.
	Go to sleep. Daria and Kristal sleep quickly. Amy reads.

Challenge

See how well you remember the events. Ask your partner to name a character, and see if you can recount all of their movements without looking at your table.

Chemical Matter | Activity Book 55

ACTIVITY 5.1

NAME: ______________ DATE: ______________

POLICE REPORT

In the space below, write a first draft of the police report to the sheriff.

Remember to:

- Concisely summarize the events.
- Make sure the sheriff can easily find the most important information.
- Be objective and state only facts.

Please see Writing Rubric in Teacher Resources for this Activity for guidance.

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ACTIVITY 6.1

NAME: ______________ DATE: ______________

As you read Chapter 4 in your pairs, complete the questions below. One of you should complete the questions for Julian and the other for Kristal. You will then use the answers to these questions to continue to develop your character maps from Lesson 3 (Activity Page 3.3).

JULIAN

How does Julian feel when he is told his discovery isn't gold? Quote from the text.

"Very disappointed"

Why does Julian feel this way? Can you point to clues about Julian's personality from other chapters to help you answer?

Students should be able to point to Julian's earlier remarks about wanting to be famous like his father.

Challenge:

Why might Julian not wish to look for small fossils anymore?

Students should make the link between Julian's own disappointment and Matt's subsequent discovery. They might make assumptions about envy.

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ACTIVITY 6.1

NAME: ______________ DATE: ______________

KRISTAL

Why did Kristal's eyes go "wide with surprise"?

Because she didn't think anyone had seen her drawings.

Why is Kristal worried about people seeing her drawings?

She thinks people "will make fun of [her] drawings."

What do you think Kristal's reluctance to show her drawings tells us about her character?

Answers will vary but may suggest a lack of confidence, or shyness.

Language Challenge

Now answer the following questions in your pair.

The text says Amy's mind keeps "wandering." Wander is another word for walk. What kind of literary device is it to say that Amy's mind is wandering?

metaphor (figurative language)

What is the link between the literal and the metaphorical definition of something "wandering"?

Answers will vary but should relate to the idea of "walking" or "going on a journey" in one's mind.

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ACTIVITY PAGE 6.2

NAME: ______________________ DATE: ________

In your pairs, read below the paragraphs from the Reader and answer the questions about the text.

1. He cleared his throat and suddenly turned to Tess. "I was wondering, Tess, just what is the difference between gold and fool's gold?"

   Amy thought Felix just asked the question to turn her attention away from him.

   Tess didn't notice, though, and was happy to answer it. "Remember that atoms are the smallest particles of matter. The thing is, you don't find many atoms all by themselves in nature. Atoms typically join together, or bond as chemists say, into groups of two or more to form molecules. Some molecules are made up of atoms of just a single element. A lump of gold, for example, would be made up of many gold atoms bonded together."

   How are atoms usually found in nature?

   Bonded in groups of two or more as molecules.

ACTIVITY PAGE 6.2

NAME: ______________________ DATE: ________

2. "Most molecules, though, are combinations of two or more different elements. A molecule of iron pyrite, for example, has two atoms of the element sulfur bonded to an atom of the element iron. Molecules that contain atoms of two or more different elements are called compounds. Water is another example of a compound. A water molecule is made up of two atoms of the element hydrogen and one atom of the element oxygen."

   Are molecules usually made up of one element or more than one? What are molecules made up of more than one element called?

   More than one; compounds.

ACTIVITY PAGE 6.2

NAME: ______________________ DATE: ________

3. "Is that why people sometimes call water 'H-2-O'?" Daria asked.

   "Precisely," Tess replied. "There are millions of molecules that are compounds and you can find them everywhere and in everything. This sandstone rock we're scratching away is made of molecules that are compounds. So are these dinosaur fossils, and the tools we're using. Each one of you is a walking, talking collection of different compounds that make up your bones, muscles, nerves, and everything else in your bodies."

   Why is Daria "precisely" right?

   The term H2O implies two hydrogen atoms and one oxygen atom, which is the atomic makeup of a water molecule.

4. Dr. Forester suddenly spoke up. "Okay, here's a riddle: why are all compounds molecules, but all molecules are not compounds?"

   "Because some molecules are made up of atoms of only one element!" Matt exclaimed triumphantly.

   "Exactly right," Dr. Forester said.

   Why is Matt "exactly right"?

   Molecules that are made up of atoms of only one element are not called compounds. But all compounds are made up of bonded atoms, and are therefore molecules.

ACTIVITY PAGE 6.3

NAME: ______________________ DATE: ________

As your teacher summarizes the irst paragraph in Activity Page 6.2, copy their summary below.

Most atoms in nature are bonded into molecules. Elements are molecules with only a single element bonded together.

Now work in your pairs to summarize paragraphs 2 and 3 below.

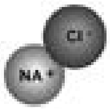
Remember to think about:

- Whether the information is chemical content.
- Whether you really need the information to understand the content.
- **Hint:** Examples might be helpful, but it is not necessary when summarizing to include them all.

ACTIVITY PAGE 6.4

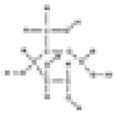
NAME: ______ DATE: ______

COMPOUNDS



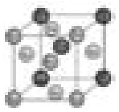
This molecule is salt.

It is a(n) compound.



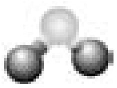
This molecule is sugar.

It is a(n) compound.



This molecule is copper.

It is a(n) element.



This molecule is water.

It is a(n) compound.

ACTIVITY 6.5

NAME: ______ DATE: ______

COMMAS

With the sentences below, circle the subject of the sentence and then insert a comma after the introductory element.

1. To find the clues, Amy had to get up very early in the morning.
2. Sensing something was wrong, Matt decided to call his sister.
3. With a gulp and a glance at Felix, Julian approached the snake.

ACTIVITY PAGE 7.1

NAME: ______ DATE: ______

Answer the questions below as you read the first half of Chapter 5.

1. What is a mixture?

   Two or more substances that are physically mixed but can be separated

2. Tess says that however much you stir a mixture, the physical properties do not change. Name examples of physical properties that do not change. (Hint: Look back at the second half of Chapter 1 in the Reader.)

   Answers should include mass, texture, and other physical properties named in Lesson 1.

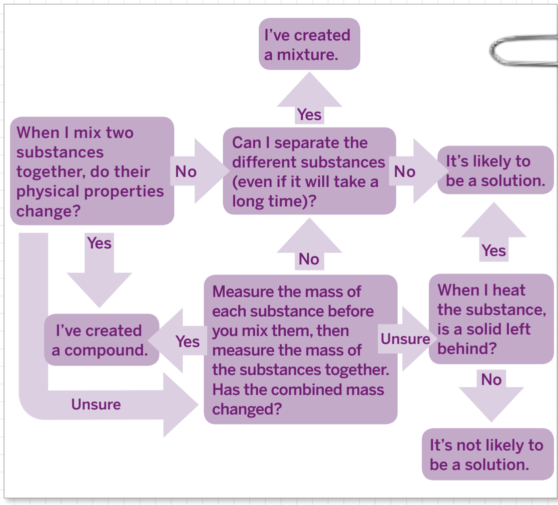
3. Imagine a container with sugar dissolved in water. Can you use the information you learned about evaporation to explain how sugar crystals might be left behind if the container were left outside on a hot day? (Hint: Sugar does not change state until it is much hotter than a hot day would make it.)

   Students should identify that the water would evaporate and that evaporation is the movement of water from liquid to gas. This would mean the water would no longer be confined to the container. Sugar would remain a solid, and be left behind.

ACTIVITY PAGE 7.2

NAME: ______ DATE: ______

In the space below, create your own "Tess's Rules" for distinguishing between a mixture, a solution, and a compound.



ACTIVITY PAGE 7.3

NAME: ______ DATE: ______

1. The animal dies.
2. The remains of the body start to rot and get covered with mud.
   "His body was covered beneath a thick layer of muddy sand."
3. Over time, layers of sediments cover the bones.
   "It was preserved for a long time, sealed beneath tons of sand."
4. The sediments encasing the bones harden into rock.
   "sealed beneath tons of sand that gradually turned to rock."
5. As the bones slowly decay, minerals filter down into space and replace the chemicals in the bones.
   "Little by little, those mineral compounds settled in tiny spaces in Achy's bones and teeth. They replaced his original compounds so that what was left at the end of this process were fossilized bones and teeth."
6. Layers of rock get worn away by wind and rain (erosion), and a fossil is discovered!

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ACTIVITY PAGE 7.3

NAME: ______ DATE: ______

Now fill in the additional information from the Reader you have found in your "treasure hunt."

LESSON AND ACTIVITY PAGE	WHAT YOU LEARNED	HOW IT HELPS YOU UNDERSTAND FOSSIL CREATION
1.2, 3.2	*Matter can be in different states: liquid, solid, and gas.*	*When water evaporates from liquid to gas, it leaves behind compounds that become the Achy Breaky fossil.*
	Most atoms are found bonded to other atoms of different elements to create compounds.	The fossil is made up of compounds that replace the dinosaur bones.
	Solids dissolved in liquids form a solution of two compounds.	Water carries compounds in solution to Achy Breaky's bones, leading to fossil creation.

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ACTIVITY 8.1

NAME: ______ DATE: ______

Hi, everyone. Your favorite detective is back (that's me, Inspector Ellis, if you were wondering) and here to help you solve the case. It's a pleasure to help when you have a devoted fan like Amy.

It seems pretty clear we have a case on our hands. So we are going to practice making deductions. Don't worry if you're slower than I am—I am brilliant (as I mentioned before). Plus, I've practiced. A lot. You don't become one of the best detectives in the world (probably the best) without investigating a lot of cases.

Amy, who is a brilliant detective in training, has decided that the thief must be "one of us." A dramatic accusation! Our task is to decide if her deductions are correct.

First, let's review Amy's actions in the text. Fill in the table below, starting to read from "Amy was trying to think like Inspector Ellis" (smart girl!) up to "the thief is one of us!" I've done the first example for you.

What Amy did	What Amy saw or said/thought
Added a possibility in her notebook	*Yesterday the soil would have been smoothed by the rain. So if fossil thieves had parked and walked to the camp, there should be clear tire tracks and boot prints.*
Slipped out of camp	Only saw footprints of ground squirrels and rabbits Finding no clue is a clue in itself.
Returns to camp and talks to Matt	The thief is one of us!

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ACTIVITY 8.1

NAME: ______ DATE: ______

Now answer the questions to see if you have been paying attention.

1. What was Amy looking for and what did she find?
   She was looking for tire tracks and boot prints. She found ground squirrel and rabbit prints but nothing else.
2. Amy says "no clue is a clue in itself." What does she mean?
   That the absence of tire tracks and boot prints is a clue.
3. Do you think the evidence supports the theory that there were fossil thieves arriving in an SUV or pickup truck?
   No.
4. Do you think Amy's deduction was correct? Why?
   Yes. Because if there had been a car, there would have been tracks, and she didn't find any.

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ACTIVITY PAGE 9.3

NAME: ______________________ DATE: __________

Use evidence from the text to answer the questions below.

1. Below is a list of the stages of removing fossil bones. Number the stages in the correct order (so 1 would be the step described first in the text). Circle any steps in which a chemical change is happening.

   3 Soaking strips of burlap in the plaster.

   6 Applying more strips on the bottom to create an "egg."

   2 Mixing plaster of paris with water in a bucket.

   4 Covering the fossil with the strips of burlap.

   5 Breaking the plaster with a chisel and hammer.

   1 Covering fossil with damp paper towels (make sure rock pillar is seen).

   Any of these steps could be considered a chemical change, because it is during these stages that the plaster of paris and water are reacting to form plaster

2. How does Tess explain the difference between a physical change and a chemical change?

   Physical changes do not change the chemical composition of matter. Chemical changes do change the chemical composition of matter.

ACTIVITY PAGE 9.3

NAME: ______________________ DATE: __________

3. What happens in a chemical change?

   The molecules of the starting substance break apart, and the atoms rearrange themselves to form new molecules of different substances.

4. If matter goes through a chemical change, are the physical properties likely to stay the same?

   No. There will be new types of matter with new properties.

5. Why does the warm bucket suggest a chemical change has taken place?

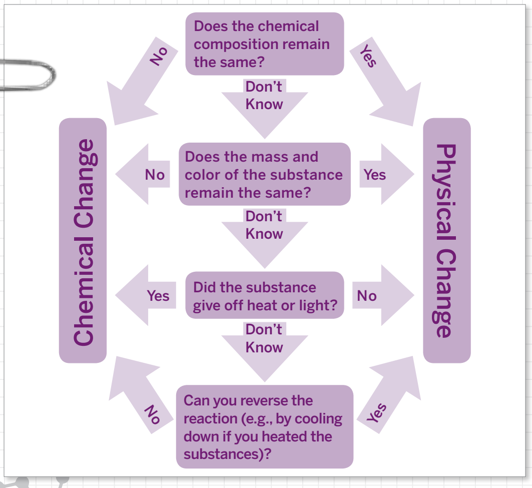
   Chemical changes often lead to heat being given off.

ACTIVITY PAGE 9.4

NAME: ______________________ DATE: __________

TESS'S RULES

In the space below, create your own "Tess's Rules" for distinguishing between a chemical change and a physical change. Use the rules you created on Activity Page 7.2 to help you.



ACTIVITY PAGE 10.1

NAME: ______________________ DATE: __________

IDENTIFYING EVIDENCE

As you read Chapter 7, note below the chemical changes the campers identify. In each case write down the chemical change and what evidence the camper or Tess offers to demonstrate it's a chemical change. The first one has been completed for you.

CAMPER(S)	CHEMICAL CHANGE	EVIDENCE GIVEN BY CAMPER
Matt and Daria	*wood burning*	*giving off heat and light* *not reversible (can't turn ash into wood)*
Felix and Kristal	marshmallows toasting	changing color and odor (physical properties) not reversible
Amy and Tess	digesting food	our bodies changing atoms rearranging to form different molecules
Kristal	ring tarnishing	? (color changes but Kristal doesn't identify this)

ACTIVITY PAGE 10.1

NAME: _______________ DATE: _______________

Do you think some of the campers identify better evidence than others? Who do you think made the best case, and who made the weakest? Why? Make sure you quote from the text in your answer.

Answers should reference evidence in previous table.

Students should recognize when evidence is observable

and precise.

ACTIVITY 10.2

NAME: _______________ DATE: _______________

There is a graphic organizer on the next page to help you organize your letter.

Write your letter below:

Dear Sheriff,

Please see Writing Rubric for this Activity in Teacher

Resources for guidance.

ACTIVITY 10.2

NAME: _______________ DATE: _______________

Challenge:

Can you come up with other plans to catch the thief using chemical and physical changes? See if you can use the materials around the campsite (like ash, wood, and marshmallows) to come up with a new plan.

You may wish to use the graphic organizer below to help you with your letter.

	Part 1: Physical Change	Part 2: Chemical Change
Matter Amy Uses	bowl of ice cubes	plaster of paris
What will happen to the matter?	melt—meaning it changes state from solid to liquid	undergo a chemical change when it encounters water
Why is this a physical/chemical change? (You may need to refer back to previous notes and chapters.)	Changes of state are physical changes: they are reversible, and the kind of matter remains the same (chemical composition doesn't change). [Other explanations are acceptable.]	It is not reversible, it gives off heat, and it turns into a different form of matter.
Why does this help catch the thief?	The water will mean that the soles of the thief's shoes will get wet, so they stick to other things the thief steps in.	When the water on the shoes encounters the plaster of paris, a reaction will occur and hard plaster will stick to the bottoms of the shoes.
Why is this objective evidence?	Only someone who walks into the lab will have plaster of paris on their shoes. There is no opinion of the person, just evidence of what action the person took (where they walked).	

ACTIVITY 10.3

NAME: _______________ DATE: _______________

COMMAS

Read the conversation below and place commas in the correct places.

"You're a bit grumpy today, aren't you," said Matt.

"No, I'm just bored," sighed Amy.

Realizing the solution, Matt went to the bookshelf and grabbed a detective novel.

"Try this," Matt said.

"Thanks!" responded Amy. "You know me pretty well, don't you?" she added.

"Yes, I guess I do," said Matt, grinning.

ACTIVITY 10.4

NAME: ____________________ DATE: __________

MORPHOLOGY

Write the correct word to complete each sentence.

1. "I waited outside the sheriff's office for about half an hour before he gave me **permission** to enter."
   (admission, permission, remission, emission)
2. "The squirrel **emitted** a loud chirruping sound before running away."
   (admitted, emitted, transmitted, permitted)
3. "The man from the SUV **admitted** he was lost."
   (admitted, emitted, transmitted, permitted)
4. "She was successful in her first **mission**."
   (missile, mission, remittance, committal)

ACTIVITY 12.1

NAME: ____________________ DATE: __________

Event: What happened?	When did it happen?
"I snuck in here later that night to see them for myself. I'd picked one up to look at it more closely when I thought I heard someone coming, and without thinking I shoved the fossil into my pocket and slipped out the back of the tent."	*at the end of Chapter 2 (the second night at camp)*
"I thought I'd just put the fossil back when no one was looking, and she'd just assume she misplaced it. But every time I tried to do that, either Tess or Dr. Forester was here in the lab."	**the following day (the third day at camp)**

ACTIVITY 12.1

NAME: ____________________ DATE: __________

Why did it happen?	Were there any clues this was happening?
Julian "didn't want to wait" until the morning to see the fossils.	*"I want to look at them!" Julian said, jumping up from his chair and heading for the lab.* *Dr. Forester caught him by the shoulder. "If you don't mind, Julian, let's wait until morning. It's really time for everyone to head for bed."* *Julian shrugged and reluctantly said, "Okay."* *(quote from end of chapter 2)*
He couldn't find the opportunity.	

ACTIVITY 12.1

NAME: ____________________ DATE: __________

"Then we found more fossils and Dr. Forester started talking about how great it would be if she could get some of them to fit together. I thought since I had the missing piece that maybe I could use it to figure that out, and maybe it would turn out be an important new discovery."	**between Chapter 5 and Chapter 6**
"Once I had the fossils, I couldn't make any sense of them. I couldn't even figure out a way to put them back in the lab without getting caught. So I put them in a sack and hid them under a bush."	**Chapter 6**
"So last night I brought the fossils back and put them there on the table. It seemed better than being caught with them red-handed or having to admit in front of everyone what I did. I didn't think much further than that."	**between Chapters 7 and 8 (the previous night)**

ACTIVITY 12.1

NAME: ______________________ DATE: ______________

Julian wants to fit the fossils together so his dad will be proud of him.	"Here comes Dr. Forester," Julian said. Amy got the impression he had been waiting for her, and when she sat down, he asked her again if she'd had any luck figuring out what kind of animal the small gully fossils had belonged to.
Julian couldn't figure out how to solve the puzzle or how to put the fossils back.	Amy said she hadn't, and then something occurred to her. "So, Julian, what are you doing out here?" "It was . . . it was getting time to leave and . . . I spotted you out here so I thought I'd come and get you." The words tumbled out of his mouth in a sudden rush. "Well," Amy said, watching him closely, "it's a good thing you did."
Dr. Forester had gone to get the sheriff, so he had the opportunity.	

ACTIVITY 12.3

NAME: ______________________ DATE: ______________

ACCUSATION TO THE SHERIFF

As you work with the teacher, fill in the table below.

	Character's wants	Character's behavior	Character's resolution
Daria	*She misses her mother.*	She disappears into the night (objective). She seems "strangely excited" later (subjective) She seems "nervous" at the campsite (subjective)	She was out in the middle of the night (her behavior) because she found a signal to call her mother (her wants).
Felix	He wants to eat.	Popped something into his mouth then asked a question (objective) to distract (subjective) Puts lock on backpack (objective) Any reference to Felix eating."	He was keeping "survival rations."
Squirrels	They want to take food.	Steal Amy's lunch (objective) Footprints near campsite (objective)	Reason Dr Forester gives for bones going missing.
SUV	They are looking for lost cattle (we do not know this until the end)	Slowly approached (objective) Looked like it turned around when it saw campers (subjective)	See wants

ACTIVITY 12.4

NAME: ______________________ DATE: ______________

GRAMMAR

1. **Use the word in brackets** to complete the sentence, turning the word into the past perfect tense.

   They ate the snacks that Felix ___provided___. (provides)

   Amy read the letter Inspector Ellis ___sent___. (send)

   They talked about the case they ___solved___. (solve)

   I edged away from the snake I ___spotted___. (spot)

   We carefully removed the egg we ___excavated___. (excavate)

2. **For two of the example sentences above,** can you list the order of the actions in the space below?

   ____

   ____

   ____

   ____

   ____

   ____

ACTIVITY PAGE 13.1

NAME: ______________________ DATE: ______________

CHAPTER 13

Read Chapter 13 up to "That's absolutely amazing," **and answer** the questions below:

1. Tess says chemical changes are the "ultimate" recyclers. Why do you think she used the word *ultimate*?

   because chemical changes can recombine elements in lots of different ways, and again and again

2. Plants 300 million years ago had bodies built from compounds. What are compounds?

   molecules with more than one element in them

3. What element existed in all of those compounds?

   carbon

4. Name the chemical changes that converted the plants into a plastic bottle.

   1. Chemical changes from plants to coal or oil

   2. Chemical changes from coal/oil into the plastic bottle

5. Which of those chemical changes happened without humans and which required humans?

   The first was natural and the second required humans.

ACTIVITY PAGE 13.2

NAME: ______________________ DATE: __________

Continue reading Chapter 13 up to "'Thanks, Achy-Breaky,' he said, 'I needed that.'" Answer the question below each paragraph:

> "In photosynthesis, the atoms making up molecules of water and carbon dioxide are recombined, using energy from sunlight, to produce molecules of sugar and oxygen gas. Plants release the oxygen into the air, and use the sugar molecules to grow and build their bodies, including the parts that animals and people eat for food."

1. Three sets of chemical changes are mentioned. Can you describe them?
   Hint: Two of them were described in the chemical changes game.
   1. Water and carbon dioxide becoming sugar and oxygen
   2. Sugar molecules transforming to build plant bodies.
   3. Animals eating the plants and the compounds becoming "part of" them

> "'Excellent question, Felix.' Tess took a deep breath and let it out slowly. 'The cells of all living things produce carbon dioxide as a waste product. We get rid of it by exhaling.' Then she gestured toward the fossils that lay in the rock beside them. 'Whenever something dies, like good old Achy-Breaky, the compounds in its body are broken down and the atoms that formed them are recycled. Some chemical changes that are part of decomposition return carbon to the air as carbon dioxide.'"

2. Why did Tess take a deep breath and let it out slowly?
   To show breathing in oxygen and exhaling carbon dioxide

3. Tess describes two ways carbon dioxide enters the air. Exhaling is one. What is the other?
   Decomposition of dead animals

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ACTIVITY PAGE 13.2

NAME: ______________________ DATE: __________

> "'When this amazing dinosaur died, the compounds that made up his body were broken down by chemical changes. The atoms that were once part of those compounds moved on. Perhaps, thanks to chemical changes, some of Achy-Breaky's atoms are now part of compounds in the soil or the water or the air. Perhaps'—Tess paused and her voice fell to a whisper—'the air that you're breathing right now contains atoms that were once part of this dinosaur.'"

4. Tess said before this paragraph that it doesn't matter if we are breathing in the atoms of dead bodies. Why?
   Atoms are no different if they are in something dead or in something alive. They are just atoms.

Now look at the chemical formula descriptions below.

The chemical formula for plant sugar is $C_6H_{12}O_6$, where C stands for carbon, H stands for hydrogen, and O stands for oxygen. The numbers tell you how many atoms of each element are in the compound.

Carbon dioxide has the formula CO_2.

Water has the formula H_2O.

Oxygen has the formula O_2.

Using the chemical formulae and the diagram on the next page:

1. Annotate the diagram by describing how chemical changes occur through photosynthesis and beyond.
2. Draw the appropriate chemical formulae next to the appropriate parts of the diagram to explain how chemical matter is transformed through this process.

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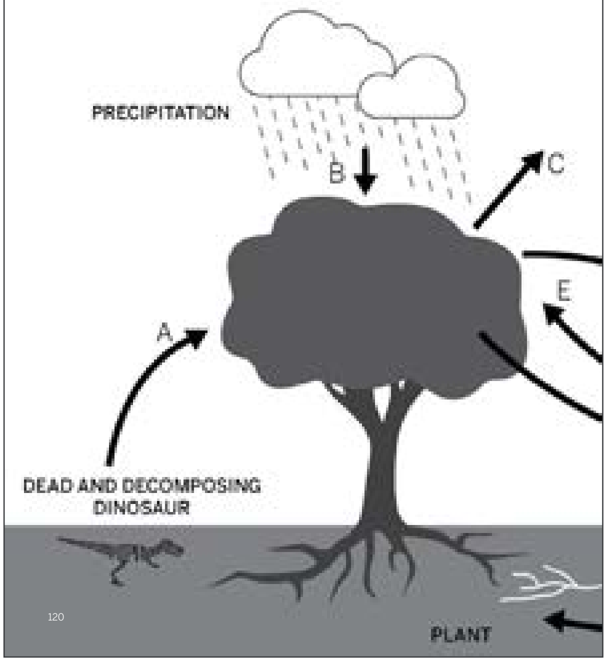
ACTIVITY PAGE 13.2

NAME: ______________________ DATE: __________



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ACTIVITY PAGE 13.2

NAME: ______________________ DATE: __________

A. CO_2

B. H_2O (water)

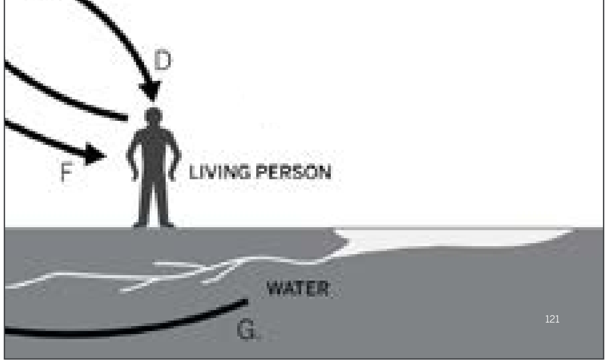
C. CO_2 (carbon dioxide)

D. O_2 (oxygen)

E. CO_2

F. $C_6H_{12}O_6$ (sugar from plant products eaten)

G. H_2O (water moving underground)



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ACTIVITY 13.3

NAME: ______________________ DATE: ____________

GRAMMAR

I. **Combine the pairs** below using the future perfect tense. The first has been completed for you.

Felix will eat cake (before he eats dinner).

"Felix will have eaten cake before he eats dinner."

Amy will go for a walk (before she goes to sleep).

Amy will have gone for a walk before she goes to sleep.

We will do the washing up (before going to bed).

We will have done the washing up before going to bed.

I will become a detective (before you become a paleontologist).

I will have become a detective before you become a paleontologist

ACTIVITY 13.4

NAME: ______________________ DATE: ____________

RESOLUTIONS

As you read, complete the table below:

	Character's wants
Amy	To be a detective Not to be at camp
Dr. Forester	To solve the question posed by the fossils

ACTIVITY 13.4

NAME: ______________________ DATE: ____________

Character's behavior	Character's resolution
Answers will vary but should point to at least one piece of evidence showing: a. Amy not wanting to be at camp b. Amy wanting to be a detective	Amy cracks a case. Amy decides she likes camp after all.
Answers will vary but should point to at least one piece of evidence that Dr. Forester is trying to figure out the bones!	Dr. Forester figures out the bones!

ACTIVITY PAGE 15.1

NAME: ______________________ DATE: ____________

1. The word *evaporate* appears several times in the first excerpt. What is the meaning of the word *evaporate*?

   A. to turn from a solid to a liquid
   B. to turn from a liquid to a gas
   C. to turn from a gas to a liquid
   D. to turn from a liquid to a solid

2. Can you provide a detail from paragraph 5 that helps the reader determine the meaning of the word *evaporate*?

   The evaporation process may take many months or even years until all the water has changed state into water vapor.

3. From the first excerpt, list three ways in which salt is produced. Give the paragraph number where the method is first introduced.

   Deposits underground (paragraph 3)

   From seawater (paragraph 3 and 4)

   From Great Lakes (paragraph 6)

ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

4. "Because solar salt production relies on evaporation, it is easy to understand why most salt ponds are located in places that tend to be hot and dry, and have very little rain." Explain why this is easy to understand.

Students should link this text to the earlier explanation of evaporation.

5. We are told that Alice "lamented." From the context, what do you think *lamented* means?

A. to express sorrow
B. to express happiness
C. to express tiredness
D. to express laziness

Give a reason from the text for your answer.

Students should reference Alice's description of the lesson.

6. In the last paragraph of the second excerpt we are told Trevor's eyes "lit up." Is that a literal description? If not, what is it?

Figurative (metaphor)

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ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

7. What inference can we make about Alice's feelings about science from the second excerpt?

A. She hates it.
B. She is confused by it.
C. It is her favorite subject.
D. It is okay but she prefers ice cream.

Provide evidence from the text, citing the paragraph number or providing quotes, for your answer below.

Answers will vary but should cite the text where Alice describes her lack of understanding of the material.

8. One of these excerpts is informational, and the other is literary. Can you identify which is which? Provide reasons for your answer.

First is informational, second is literary. Answers should include objective facts (for first), use of characters and narrative (for second).

9. For the literary text, can you name some informational elements in that text?

Answers should include objective facts/chemical content.

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ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

10. In the table below, describe how Trevor uses ice cream as an analogy for atoms and compounds.

Concept	How it links to ice cream
periodic table of elements	*chalkboard showing ice cream flavors*
Element	Ice Cream Flavor
Atom	Scoop
Molecule	Two Scoops
Compound	Two scoops of different flavors

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ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

12. Read both excerpts. Can you use the information on elements and compounds in the second excerpt along with information from the first excerpt to explain why salt is a compound? Reference the text from the excerpts you are using.

Answers should combine the information on the chemical formula of salt with the explanation of elements and compounds to identify why salt is a compound.

13. Read both excerpts. Can you explain, using examples from both excerpts, the differences between an element, a compound, and a solution?

Answers should combine information from both texts and background knowledge to identify

a. An element containing only one kind of bonded atom
b. A compound containing more than one kind of bonded atom
c. A solution containing non-bonded elements or compounds mixed together/dissolved

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ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

14. Reread paragraphs 4 and 5 of the first excerpt. In the space below, write a narrative literary text that conveys the content in these paragraphs. Complete the table underneath your narrative to explain what you have done.

Please see Writing Prompt scoring rubric in the Teacher Guide for this lesson.

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ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

Grammar

1. Expand each sentence below using descriptive details, including adjectives and adverbs. You may replace words if you maintain the same meaning.
   - Amy solved the case.
   - I listened to Trevor's explanation.
   - She walked into the ice cream parlor.

   Answers will vary but should include at least one adjective or adverb while maintaining the same meaning.

2. Combine each pair of sentences below and underline the linking word you have used.
   - I went into the ice cream parlor. The owner smiled at me.
   - I went into the ice cream parlor. I was hungry.
   - I went into the ice cream parlor. I walked right out again.

   1. I went into the ice cream parlor and the owner smiled at me.
   2. I went into the ice cream parlor because I was hungry
   3. I went into the ice cream parlor but I walked right out again.

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3. Reduce each of the following sentences to be as concise as possible.
   - The ice cream, soft and tingly on the tongue, made me sigh with pleasure as I devoured it.
   - Salt, which is a fascinating compound, can be extracted in many ways, some of them from ancient times, while some are more modern.

   Answers will vary but examples are as follows: 1.) Ice cream is soft and tingly on the tongue. I sigh with pleasure as I devour it. 2.) Salt is a fascinating compound. It can be extracted in many ways. Some of these are from ancient times while some are more modern

4. Circle the subject of each sentence below and then insert a comma after the introductory element.

   A. To be first in line, Alice had to queue outside the parlor for a long time.

   B. Realizing she was annoyed, Trevor let Alice finish her sentence.

   C. Putting her hand in her pocket, Alice said, "I'll buy this."

5. Insert a comma into each of the sentences below in the relevant place and circle it.

   A. You think I'm talking too much, don't you?

   B. Yes, I suppose I do.

   C. It wouldn't help if I taped my mouth shut, would it?

   D. No, I don't think that's a good idea.

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6. Use the events below to construct sentences in the past perfect tense.

   Event 1: going to the ice cream parlor; Event 2: learning about chemistry

   I had been to the ice cream parlor before I learned about chemistry.

   Event 1: evaporating seawater; Event 2: extracting salt

   The seawater had evaporated before we extracted the salt.

Morphology

7. Write the correct word to complete each sentence, adding the suffix *–ment*.

   A. Solving the case was a great achievement.
   (amaze, achieve, align, excite)

   B. People had different views on the culprit. It caused great disagreement.
   (agree, disagree, judge, enforce)

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8. Write the correct word to complete each sentence:

A. "I applied three times before I was given **permission** to join the fossil dig."
(admission, permission, remission, emission)

B. "I **admitted** that I didn't understand what she was talking about."
(admitted, emitted, transmitted, permitted)

C. "Your **mission**, should you choose to accept it, is . . ."
(mission, missile, admission, transmission)

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

Questions

1. Why did the Great Spirit make feathered suits for the birds?
   A. He wanted to use the feathers he had for something.
   B. He couldn't make up his mind about which birds he liked best.
   C. He didn't like the way the birds' bodies and long legs looked.
   D. He wanted the birds to be warm.

2. Why did Turkey Buzzard try on every suit?
   A. He couldn't make up his mind about which would be the best suit to wear.
   B. He wanted to touch all the feathers.
   C. He was told he could try on each suit as many times as he wanted.
   D. He had to fly a long way to get to the suits.

3. A simile compares two things, usually using *like* or *as*. What does the following simile from Paragraph 11 mean?

   The next suit shone like gold and the feathers were a beautiful yellow.

   A. The suit was dull in color and less attractive than the other suits.
   B. The suit had many colors that made it attractive to look at.
   C. The feathers were made of gold and they shone in the sunlight.
   D. The bright yellow feathers made the suit vibrant and colorful, as if it were made of gold.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

4. What was wrong with each of the following suits Turkey Buzzard tried on?

Suit	What was wrong with it?
first suit	feathers were too long and trailed on the ground as he walked; he could not fly well in them
next suit	all the other birds would see him because he would shine like the face of the Great Spirit
third suit	it would get dirty too soon
fourth suit	not enough feathers
fifth suit	too many feathers and too many pieces

The following question has two parts. Answer Part A and then answer Part B.

5. **Part A**: What is the meaning of the word *homeliest* in the following sentence from paragraph 20?

   Turkey Buzzard thought it was the homeliest suit of all.

   A. colorful
   B. itchy
   C. appealing
   D. unattractive

   Part B: Underline the words and phrases in the text that helped you determine the meaning of *homeliest*.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

6. Why did Turkey Buzzard hold his head high and walk proudly in his chosen suit among the other birds?

   Answers may vary, but could include that Turkey Buzzard decided to be proud of the suit he ended up choosing. He tried on all the other suits and found something wrong with each one. The suit he chose was the last suit available, but he kept it on and wore it proudly. He did not allow the other birds' teasing to bother him.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

Questions

7. What is the painter Titian known for?
   A. richness of color in landscapes and portraits
   B. religious art
   C. working with the artist Giorgione
   D. being the son of a noble

The following question has two parts. Answer Part A and then answer Part B.

8. **Part A**: What work made it clear that Titian would bring fame and honor to Venice?
   A. the first purely landscape picture he created
   B. pictures he painted using juices of flowers
   C. the portrait of Emperor Charles V
   D. the walls of the Exchange above the Rialto Bridge

   Part B: Why did this work make it clear Titian was a talented painter?

   Titian's work frescoing the walls of the Exchange above the Rialto Bridge was highly praised and it was thought to be better than Giorgione's work on the same project. In addition, he was invited to finish the frescoes in the Grand Council chamber and to paint the portraits of the Doges, Venice's rulers.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

9. Why is it not surprising that Titian was the first artist to paint a purely landscape picture?
   A. He grew up in Venice, among the canals and busy trading atmosphere.
   B. He grew up in the mountains, among beautiful, natural scenes.
   C. He grew up in Rome, around religious art commissioned by the pope.
   D. He grew up in a busy city, around lots of people, merchants, and art.

10. What does the following sentence from paragraph 9 mean?

    Fame and wealth awaited Titian wherever he went.

    A. It was hard for Titian to find work no matter where he went.
    B. Titian was so talented that wherever he went he became famous and wealthy.
    C. Titian became famous and wealthy only when he worked with Giorgione.
    D. Titian became famous and wealthy only because he worked with Michelangelo.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

Questions

11. What improvements in transportation are presented in this passage? Circle all that apply.
    A. roads widened to handle wagons and horses
    B. stagecoach travel
    C. turnpikes
    D. flatboats
    E. steamboats

12. Why did road owners collect a toll?

    People figured if they could build good roads, they could charge people for using them.

13. Why were improvements in transportation needed in the United States in the 1700s and 1800s?
    A. The population in the United States was declining, as was the need for transportation was methods.
    B. The population in the United States was growing and spreading, and transportation was needed to accommodate those changes.
    C. People didn't need to use roads and waterways for travel or for shipping goods.
    D. Turnpike developers stopped collecting tolls from travelers using the roads.

ACTIVITY PAGE A.1

NAME: ______________________ DATE: __________

The following question has two parts. Answer Part A and then answer Part B.

14. **Part A**: What is the meaning of the word *folly* in the following sentence from paragraph 12?

    Others who saw this odd-looking boat laughed and called it a different name: Fulton's Folly.

    A. important improvement
    B. new approach
    C. foolish idea
    D. slow method

    Part B: What words and phrases in the text helped you determine the meaning of *folly*?

    "Others who saw this odd-looking boat laughed…"

15. The idiom *had the last laugh* means to succeed when others thought you wouldn't. What does it mean in paragraph 12 when it says Fulton had the last laugh?

    Fulton's odd-looking boat, which people had laughed a and called a folly, was actually very successful and changed the way passengers and goods traveled up and down waterways.

ACTIVITY PAGE A.1

NAME: ____________________ DATE: __________

16. Compare and contrast the stagecoach, turnpikes, and the steamboat as improvements in transportation. Which improvement best addressed transportation issues and why?

The steamboat best addressed transportation issues because it changed the way travel occurred up and down waterways. While improved roads did allow for stagecoach travel, traveling in a stagecoach was uncomfortable, and stops along the way had bad food and poor sleeping conditions. Turnpikes were in better condition than other roads, but they were just as dusty and muddy as the older roads, travelers had to pay to use them, and they did not extend very far west, where the population was spreading.

End-of-Year Reading Comprehension Score: _______ **/16 points**

To receive a point for a two-part question (i.e., 5, 8, and 14), students must correctly answer both parts of the question.

ACTIVITY PAGE A.3

NAME: ____________________ DATE: __________

End-of-Year Grammar Assessment

Read and answer each question.

For each sentence, draw a vertical line separating the subject and predicate. Circle the entire subject. Draw a wiggly line under the entire predicate.

1. Copernicus | observed that the planets moved in ways that didn't agree with the long-held geocentric model.
2. The Maya and the Aztec civilizations | developed in Mesoamerica.

Read each pair of sentences about Don Quixote. If the information in the pair of sentences is similar, rewrite the two sentences using a transition word or phrase that compares the two sentences. If the information in a pair of sentences is different, combine the sentences using a word or phrase that contrasts the two sentences.

Words and Phrases That Compare	Words and Phrases That Contrast
in the same way	on the other hand
similarly	alternatively
just as	in contrast
also	instead

3. Don Quixote thought he saw a man wearing an enchanted helmet. Sancho saw a barber riding a donkey and wearing a basin on his head to protect it from the rain.

Answers may vary.

ACTIVITY PAGE A.3

NAME: ____________________ DATE: __________

4. Don Quixote meddled in an interaction between a farmer and a young boy. Don Quixote meddled in a situation with merchants and servants.

Answers may vary.

5. Don Quixote is idealistic, or thinks positively about things. Sancho is realistic, or sees things the way they actually are.

Answers may vary.

For each of the following sentences, identify the subject by circling it. Then identify the verb. If it is an action verb, underline it with a straight line. If it is a linking verb, underline it with a wiggly line.

6. Guild members in Florence chose Ghiberti to help Brunelleschi build the cathedral dome.
7. Brunelleschi was angry.
8. In the summer of 1911, Ishi emerged from the wilderness in Oroville.
9. He was a very unusual sight.

ACTIVITY PAGE A.3

NAME: ____________________ DATE: __________

Use the information provided in the "Subject" and "Verb" columns of the following chart to fill in the "Agreement in the Present Tense" column so the subject and verb are in agreement in the present tense.

Subject	Verb	Agreement in the Present Tense
I	to be	10. I am
the sky	to look	11. The sky looks
the authors	write	12. The authors write
he	to see	13. He sees
they	run	14. They run
we	to be	15. We are

Write a complete sentence for any of the subject-verb agreement statements you created in the chart.

16. Answers will vary but should show correct usage of the present tense.

ACTIVITY PAGE A.3

NAME: ______ DATE: ______

For each of the following items in a series, write a complete sentence using commas correctly.

crisp air colorful leaves hot cider

17. Answers will vary but should show correct usage of commas.

carrots peas potatoes

18. Answers will vary but should show correct usage of commas.

ACTIVITY PAGE A.3

NAME: ______ DATE: ______

Use the information provided in the "Subject" and "Verb" columns of the following chart to fill in the "Agreement in the Past Tense" column so the subject and verb are in agreement in the past tense.

Subject	Verb	Agreement in the Past Tense
Leonardo da Vinci	to have	19. Leonardo da Vinci had
Native Americans	to be	20. Native Americans were
Jacob	to see	21. Jacob saw
I	to be	22. I was
we	to have	23. We had
she	to feel	24 She felt

Write a complete sentence for any of the subject-verb agreement statements you created in the chart.

25. Answers will vary but should show correct usage of the present tense.

ACTIVITY PAGE A.3

NAME: ______ DATE: ______

Use the correct preposition from the word box to complete each sentence. Then write the function (place, time, or partner) in the box below the preposition.

out	with	after	in

26. Galileo was born in (*place*) Pisa, Italy, in 1564 CE and lived with (*partner*) Copernicus, building on Copernicus's work.

27. The Arapahoe and Cheyenne fought with (*partner*) the Lakota at the Battle of the Little Bighorn.

For each pair of words, write a sentence using the correlative conjunctions correctly.

28. *not only/but also*

Answers will vary but should use the correlative conjunctions correctly.

29. *either/or*

Answers will vary but should use the correlative conjunctions correctly.

ACTIVITY PAGE A.3

NAME: ______ DATE: ______

Underline the interjection in each sentence. Then write the type of interjection on the line that follows, *strong* or *mild*.

30. Stop! There might be poison ivy under that bush.

Type: strong

31. Oh, let's come back later when the store is less crowded.

Type: mild

For each word provided in Column 1: Word(s), write one correct pronoun in Column 2: Pronoun.

Column 1: Word(s)	Column 2: Pronoun
Isabella d'Este	32. she
the clouds	33. they
Mom, Dad, and I	34. we
the teacher	35. he, she
Martin Luther	36. he
my sister	37. she

ACTIVITY PAGE A.3

NAME: ______________________ DATE: __________

Select one row from the chart, and write two sentences. The first sentence should use the noun in Column 1: Word(s) as the subject, and the second sentence should use the pronoun in Column 2: Pronoun as the subject.

38. Answers may vary.

Fill in the blanks with the correct pronoun antecedent from the box.

his	her	their	its

39. Martin Luther nailed his Ninety-Five Theses to the church door at the University of Wittenberg.

40. Both the Maya and the Aztec built temples in their important city centers.

41. The woman shown in Leonardo da Vinci's painting *Mona Lisa* is well-known for her mysterious smile.

42. When Native Americans on the Great Plains hunted the buffalo, they used their hide for clothing, tepee covers, bedding, and moccasins.

ACTIVITY PAGE A.3

NAME: ______________________ DATE: __________

Add a comma in the appropriate place for each of the following sentences.

43. First, I will finish my homework.

44. Oh, Roberto said it would be easy and it was!

45. Well, we won't get to the field before the game starts.

Read each set of sentences. If the verb tenses are the same and correct, put a ✓ (check mark). If there is an inappropriate shift in verb tense, put an X on the line. Rewrite the sentence(s) marked with an X with the correct verb tense(s).

46. X Don Quixote tried to do what he thought was right. Sometimes he will make mistakes when he will attempt to fix things.

Rewrite sentence(s), if needed:

Don Quixote tried to do what he thought was right. Sometimes he made mistakes when he attempted to fix things.

47. ✓ Rather than conquer or tame the land, Native Americans blended into the land. They built sturdy, cozy houses.

Rewrite sentence(s), if needed:

Answers will vary but should show correct usage of the present tense.

ACTIVITY PAGE A.3

NAME: ______________________ DATE: __________

Fill in the blanks with the best transitional words or phrases that help make the sentences flow together.

48. Don Quixote and Sancho Panza traveled for days. (*First/At last*) at last, they arrived home.

49. Custer was sure he and his soldiers would win the Battle of the Little Bighorn. (*Next/In the end*) in the end, though, the Lakota and their allies won.

Insert a comma in the correct place in the following sentences.

50. No, we won't have time to stop at the craft store before dinner.

51. Teresa, can you please fill this cup with water for the experiment?

52. Saturday is the first day of spring, isn't it?

Circle the correct way to write the following titles.

53.	Chapter	"Myths of the Maya"	Myths of the Maya
54.	Book	"Shifts in Power"	*Shifts in Power*
55.	Work of Art	"Self-Portrait" by Sofonisba Anguissola	*Self-Portrait* by Sofonisba Anguissola

End-of-Year Grammar Score: _______ /55 points

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

End-of-Year Morphology Assessment

Read and answer each question. Some questions have two parts. Answer Part A and then answer Part B.

For 1 and 2, write the correct word to complete each sentence.

1. Be sure to take your time when you write the note, because the last time, your handwriting was illegible (legible, illegible, legal, illegal), and I couldn't figure out the message.

2. I have a regular (responsible, irresponsible, regular, irregular) piano lesson each week that I attend on Tuesday of each week.

3. If someone is working on an *international* project, what does that mean?

   A. That person is working on a project that involves one or more countries outside of the country in which he or she lives.

   B. That person is working on a project alone with no help.

   C. That person is working on a project for the country where he or she lives.

   D. That person is working on a project with one other person.

4. If you *distract* someone from what they are doing, you are __________

   A. helping them concentrate

   B. adding more work for them to complete

   C. taking their attention away from what they are doing

   D. asking them to explain what they are doing

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

5. Which of the following words with the suffix *–ness* means the state or condition of being about to fall asleep?
   A. steadiness
   B. crispness
   C. drowsiness
   D. emptiness

The following question has two parts. Answer Part A and then answer Part B.

6. **Part A**: Which of the following roots means "to empty"?
   A. *tract*
   B. *mem*
   C. *cred*
   D. *vac*

   Part B: Choose the word with the root that means "to empty" and write a sentence using the word.
   A. tractor
   B. remember
   C. credible
   D. evacuate

   Sentence: **Answers may vary.**

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

For 7 and 8, write the correct word to complete each sentence.

7. The man was clearly **impatient** (mobile, immobile, patient, impatient) about waiting in line for his turn to purchase his items at the store, as he kept checking his watch.

8. My science project is **incomplete** (audible, inaudible, complete, incomplete) because I haven't finished the last part.

9. If the dentist extracts a tooth from your mouth, what does the dentist do?
   A. The dentist puts in another tooth.
   B. The dentist pulls out a tooth.
   C. The dentist cleans a tooth.
   D. The dentist protects a tooth.

The following question has two parts. Answer Part A and then answer Part B.

10. **Part A**: What does the root *serv* mean?
   A. *to empty*
   B. *to save, protect, or serve*
   C. *to draw or pull*
   D. *to remember or recall*

   Part B: Write a sentence using the word *conserve*. Make sure the sentence demonstrates the meaning of the word.

   Answers may vary.

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

11. Which of the following demonstrates the meaning of the word *enable*?
   A. severe drought preventing farmers from getting good crops
   B. getting a good night's sleep before an important soccer game in order to play well
   C. misplacing the library book you need for your history project
   D. running late for school because you overslept

12. If someone is a *scientist*, what does that person do?
   A. performs a musical solo
   B. plays the piano
   C. works in a branch of science
   D. makes art

13. A *credible* source is one that is ________________.
   A. not trustworthy
   B. trustworthy
   C. remembered
   D. not remembered

14. Circle the correct prefix to add to the root word in the following sentence.

im–	*in–*	*post–*	*fore–*

Not every baseball team plays games during the ________________ season because only the teams that did the best during the regular season continue to play.

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

For 15 and 16, write the correct word to complete each sentence.

15. The police officer had to **direct** (cancel, cancellation, direct, direction) traffic through the intersection because the stoplights weren't working.

16. Please tell me what **revisions** (revise, revisions, decide, decisions) I should make to my essay about Don Quixote.

17. Which of the following words with the root *mem* means "easy to remember for a particular reason"?
   A. *memoir*
   B. *remember*
   C. *commemorate*
   D. *memorable*

ACTIVITY PAGE A.6

NAME: ______________________ DATE: __________

18. Explain what the following statement means:

> She had the *foresight* to save money early so when she retired, she could live comfortably.

Answers may vary but should state that the subject is looking ahead.

End-of-Year Morphology Score: _______ /18 points

Unit 8		**Correlation—Teacher's Guide**
(1) Developing and sustaining foundational language skills: listening, speaking, discussion, and thinking—oral language. The student develops oral language through listening, speaking, and discussion. The student is expected to:		
TEKS 5.1.A	listen actively to interpret verbal and non-verbal messages, ask relevant questions, and make pertinent comments	U8: p. 136, U8: p. 140
TEKS 5.1.B	follow, restate, and give oral instructions that include multiple action steps	
TEKS 5.1.C	give an organized presentation employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively	U8: p. 78, U8: p. 84, U8: p. 106, U8: p. 116, U8: p. 136, U8: p. 140, U8: p. 172, U8: p. 178
TEKS 5.1.D	work collaboratively with others to develop a plan of shared responsibilities	U8: p. 106, U8: p. 116, U8: p. 172, U8: p. 176
(2) Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking—beginning reading and writing. The student develops word structure knowledge through phonological awareness, print concepts, phonics, and morphology to communicate, decode, and spell. The student is expected to:		
(A) demonstrate and apply phonetic knowledge by:		
TEKS 5.2.A.i	decoding words with consonant changes, including /t/ to /sh/ such as in *select* and *selection* and /k/ to /sh/ such as *music* and *musician*	
TEKS 5.2.A.ii	decoding multisyllabic words with closed syllables; open syllables; VC*e* syllable; vowel teams, including digraphs and diphthongs; r-controlled syllables; and final stable syllables	
TEKS 5.2.A.iii	decoding words using advanced knowledge of syllable division patterns	
TEKS 5.2.A.iv	decoding words using advanced knowledge of the influence of prefixes and suffixes on base words	U8: p. 28, U8: p. 36
TEKS 5.2.A.v	identifying and reading high-frequency words from a research-based list	U8: p. 62, U8: p. 65, U8: p. 86, U8: p. 90, U8: p. 150, U8: p. 156
(B) demonstrate and apply spelling knowledge by:		
TEKS 5.2.B.i	spelling multisyllabic words with closed syllables; open syllables; VC*e* syllables; vowel teams, including digraphs and diphthongs; r-controlled syllables; and final stable syllables	
TEKS 5.2.B.ii	spelling words with consonant changes, including /t/ to /sh/ such as in *select* and *selection* and /k/ to /sh/ such as *music* and *musician*	
TEKS 5.2.B.iii	spelling multisyllabic words with multiple sound-spelling patterns	
TEKS 5.2.B.iv	spelling words using advanced knowledge of syllable division patterns	
TEKS 5.2.B.v	spelling words using knowledge of prefixes	
TEKS 5.2.B.vi	spelling words using knowledge of suffixes, including how they can change base words such as dropping *e,* changing *y* to *i,* and doubling final consonants	
TEKS 5.2.C	write legibly in cursive	

Unit 8		Correlation—Teacher's Guide
(3) Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking—vocabulary. The student uses newly acquired vocabulary expressively. The student is expected to:		
TEKS 5.3.A	use print or digital resources to determine meaning, syllabication, pronunciation, and word origin	
TEKS 5.3.B	use context within and beyond a sentence to determine the relevant meaning of unfamiliar words or multiple-meaning words	U8: p. 8, U8: p. 12
TEKS 5.3.C	identify the meaning of and use words with affixes such as *trans-*, *super-*, *-ive*, and *-logy* and roots such as *geo* and *photo*	U8: p. 28, U8: p. 36, U8: p. 86, U8: p. 103, U8: p. 150, U8: p. 169, U8: p. 182, U8: p. 198
TEKS 5.3.D	identify, use, and explain the meaning of adages and puns	
(4) Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking—fluency. The student reads grade-level text with fluency and comprehension. The student is expected to:		
TEKS 5.4	use appropriate fluency (rate, accuracy, and prosody) when reading grade-level text	U8: p. 28, U8: p. 37, U8: p. 62, U8: p. 65, U8: p. 86, U8: p. 90, U8: p. 150, U8: p. 156
(5) Developing and sustaining foundational language skills: listening, speaking, reading, writing, and thinking—self-sustained reading. The student reads grade-appropriate texts independently. The student is expected to self-select text and read independently for a sustained period of time.		
TEKS 5.5	self-select text and read independently for a sustained period of time	
(6) Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The student uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The student is expected to:		
TEKS 5.6.A	establish purpose for reading assigned and self-selected texts	
TEKS 5.6.B	generate questions about text before, during, and after reading to deepen understanding and gain information	
TEKS 5.6.C	make [and] correct or confirm predictions using text features, characteristics of genre, and structures	
TEKS 5.6.D	create mental images to deepen understanding	
TEKS 5.6.E	make connections to personal experiences, ideas in other texts, and society	
TEKS 5.6.F	make inferences and use evidence to support understanding	U8: p. 28, U8: p. 37, U8: p. 44, U8: p. 57, U8: p. 62, U8: p. 65, U8: p. 86, U8: p. 90, U8: p. 122, U8: p. 126
TEKS 5.6.G	evaluate details read to determine key ideas	U8: p. 28, U8: p. 37, U8: p. 122, U8: p. 134
TEKS 5.6.H	synthesize information to create new understanding	U8: p. 8, U8: p. 24, U8: p. 28, U8: p. 32, U8: p. 44, U8: p. 49, U8: p. 62, U8: p. 65, U8: p. 86, U8: p. 97, U8: p. 106, U8: p. 109, U8: p. 116, U8: p. 136, U8: p. 140, U8: p. 141, U8: p. 200, U8: p. 204
TEKS 5.6.I	monitor comprehension and make adjustments such as re-reading, using background knowledge, asking questions, and annotating when understanding breaks down	

Unit 8

		Correlation—Teacher's Guide
(7) Response skills: listening, speaking, reading, writing, and thinking using multiple texts. The student responds to an increasingly challenging variety of sources that are read, heard, or viewed. The student is expected to:		
TEKS 5.7.A	describe personal connections to a variety of sources, including self-selected texts	
TEKS 5.7.B	write responses that demonstrate understanding of texts, including comparing and contrasting ideas across a variety of sources	
TEKS 5.7.C	use text evidence to support an appropriate response	U8: p. 8, U8: p. 12, U8: p. 44, U8: p. 57, U8: p. 78, U8: p. 84, U8: p. 86, U8: p. 90, U8: p. 97, U8: p. 106, U8: p. 109, U8: p. 116, U8: p. 122, U8: p. 126, U8: p. 136, U8: p. 140, U8: p. 141, U8: p. 150, U8: p. 156, U8: p. 172, U8: p. 178, U8: p. 200, U8: p. 204, U8: p. 214
TEKS 5.7.D	retell, paraphrase, or summarize texts in ways that maintain meaning and logical order	U8: p. 62, U8: p. 75
TEKS 5.7.E	interact with sources in meaningful ways such as notetaking, annotating, freewriting, or illustrating	U8: p. 44, U8: p. 49, U8: p. 62, U8: p. 75, U8: p. 200, U8: p. 204
TEKS 5.7.F	respond using newly acquired vocabulary as appropriate	
TEKS 5.7.G	discuss specific ideas in the text that are important to the meaning	
(8) Multiple genres: listening, speaking, reading, writing, and thinking using multiple texts—literary elements. The student recognizes and analyzes literary elements within and across increasingly complex traditional, contemporary, classical, and diverse literary texts. The student is expected to:		
TEKS 5.8.A	infer multiple themes within a text using text evidence	
TEKS 5.8.B	analyze the relationships of and conflicts among the characters	U8: p. 44, U8: p. 57, U8: p. 86, U8: p. 90, U8: p. 122, U8: p. 126, U8: p. 182, U8: p. 185, U8: p. 200, U8: p. 214
TEKS 5.8.C	analyze plot elements, including rising action, climax, falling action, and resolution	U8: p. 182, U8: p. 185, U8: p. 200, U8: p. 214
TEKS 5.8.D	analyze the influence of the setting, including historical and cultural settings, on the plot	U8: p. 8, U8: p. 12
(9) Multiple genres: listening, speaking, reading, writing, and thinking using multiple texts—genres. The student recognizes and analyzes genre-specific characteristics, structures, and purposes within and across increasingly complex traditional, contemporary, classical, and diverse texts. The student is expected to:		
TEKS 5.9.A	demonstrate knowledge of distinguishing characteristics of well-known children's literature such as folktales, fables, legends, myths, and tall tales	
TEKS 5.9.B	explain the use of sound devices and figurative language and distinguish between the poet and the speaker in poems across a variety of poetic forms	
TEKS 5.9.C	explain structure in drama such as character tags, acts, scenes, and stage directions	
(D) recognize characteristics and structures of informational text, including:		
TEKS 5.9.D.i	the central idea with supporting evidence	
TEKS 5.9.D.ii	features such as insets, timelines, and sidebars to support understanding	U8: p. 8, U8: p. 24, U8: p. 28, U8: p. 32
TEKS 5.9.D.iii	organizational patterns such as logical order and order of importance	U8: p. 8, U8: p. 24, U8: p. 28, U8: p. 32
(E) recognize characteristics and structures of argumentative text by:		
TEKS 5.9.E.i	identifying the claim	

Unit 8

		Correlation—Teacher's Guide
TEKS 5.9.E.ii	explaining how the author has used facts for or against an argument	U8: p. 78, U8: p. 84, U8: p. 150, U8: p. 156
TEKS 5.9.E.iii	identifying the intended audience or reader	
TEKS 5.9.F	recognize characteristics of multimodal and digital texts	
(10) Author's purpose and craft: listening, speaking, reading, writing, and thinking using multiple texts. The student uses critical inquiry to analyze the authors' choices and how they influence and communicate meaning within a variety of texts. The student analyzes and applies author's craft purposefully in order to develop his or her own products and performances. The student is expected to:		
TEKS 5.10.A	explain the author's purpose and message within a text	
TEKS 5.10.B	analyze how the use of text structure contributes to the author's purpose	
TEKS 5.10.C	analyze the author's use of print and graphic features to achieve specific purposes	
TEKS 5.10.D	describe how the author's use of imagery, literal and figurative language such as simile and metaphor, and sound devices achieves specific purposes	
TEKS 5.10.E	identify and understand the use of literary devices, including first- or third-person point of view	
TEKS 5.10.F	examine how the author's use of language contributes to voice	
TEKS 5.10.G	explain the purpose of hyperbole, stereotyping, and anecdote	
(11) Composition: listening, speaking, reading, writing, and thinking using multiple texts—writing process. The student uses the writing process recursively to compose multiple texts that are legible and uses appropriate conventions. The student is expected to:		
TEKS 5.11.A	plan a first draft by selecting a genre for a particular topic, purpose, and audience using a range of strategies such as brainstorming, freewriting, and mapping	U8: p. 218, U8: p. 221
(B) develop drafts into a focused, structured, and coherent piece of writing by:		
TEKS 5.11.B.i	organizing with purposeful structure, including an introduction, transitions, and a conclusion	
TEKS 5.11.B.ii	developing an engaging idea reflecting depth of thought with specific facts and details	
TEKS 5.11.C	revise drafts to improve sentence structure and word choice by adding, deleting, combining, and rearranging ideas for coherence and clarity	U8: p. 28, U8: p. 34, U8: p. 62, U8: p. 74, U8: p. 78, U8: p. 82
(D) edit drafts using standard English conventions, including:		
TEKS 5.11.D	edit drafts using standard English conventions	U8: p. 182, U8: p. 196, U8: p. 200, U8: p. 212
TEKS 5.11.D.i	complete simple and compound sentences with subject-verb agreement and avoidance of splices, run-ons, and fragments	
TEKS 5.11.D.ii	past tense of irregular verbs	
TEKS 5.11.D.iii	collective nouns	

Unit 8		Correlation—Teacher's Guide
TEKS 5.11.D.iv	adjectives, including their comparative and superlative forms	
TEKS 5.11.D.v	conjunctive adverbs	
TEKS 5.11.D.vi	prepositions and prepositional phrases and their influence on subject-verb agreement;	
TEKS 5.11.D.vii	pronouns, including indefinite	
TEKS 5.11.D.viii	subordinating conjunctions to form complex sentences	U8: p. 62, U8: p. 74
TEKS 5.11.D.ix	capitalization of abbreviations, initials, acronyms, and organizations	
TEKS 5.11.D.x	edit drafts using standard English conventions, including: italics and underlining for titles and emphasis, and punctuation marks, including quotation marks in dialogue and commas in compound and complex sentences	U8: p. 86, U8: p. 102, U8: p. 150, U8: p. 168
TEKS 5.11.D.xi	correct spelling of words with grade-appropriate orthographic patterns and rules and high-frequency words	
TEKS 5.11.E	publish written work for appropriate audiences	
(12) Composition: listening, speaking, reading, writing, and thinking using multiple texts—genres. The student uses genre characteristics and craft to compose multiple texts that are meaningful. The student is expected to:		
TEKS 5.12.A	compose literary texts such as personal narratives, fiction, and poetry using genre characteristics and craft	U8: p. 28, U8: p. 33, U8: p. 218, U8: p. 221
TEKS 5.12.B	compose informational texts, including brief compositions that convey information about a topic, using a clear central idea and genre characteristics and craft	U8: p. 8, U8: p. 23, U8: p. 78, U8: p. 82, U8: p. 106, U8: p. 109, U8: p.136, U8: p. 141
TEKS 5.12.C	compose argumentative texts, including opinion essays, using genre characteristics and craft	U8: p. 122, U8: p. 134, U8: p. 150, U8: p. 156, U8: p. 172, U8: p. 178, U8: p. 200, U8: p. 214
TEKS 5.12.D	compose correspondence that requests information	U8: p. 150, U6: p. 162
(13) Inquiry and research: listening, speaking, reading, writing, and thinking using multiple texts. The student engages in both short-term and sustained recursive inquiry processes for a variety of purposes. The student is expected to:		
TEKS 5.13.A	generate and clarify questions on a topic for formal and informal inquiry	
TEKS 5.13.B	develop and follow a research plan with adult assistance	
TEKS 5.13.C	identify and gather relevant information from a variety of sources	U8: p. 44, U8: p. 49, U8: p. 78, U8: p. 84, U8: p. 86, U8: p. 97, U8: p. 106, U8: p. 116, U8: p. 200, U8: p. 204
TEKS 5.13.D	understand credibility of primary and secondary sources	U8: p. 8, U8: p. 24
TEKS 5.13.E	demonstrate understanding of information gathered	U8: p. 122, U8: p. 134, U8: p. 172, U8: p. 176
TEKS 5.13.F	differentiate between paraphrasing and plagiarism when using source materials	
TEKS 5.13.G	develop a bibliography	
TEKS 5.13.H	use an appropriate mode of delivery, whether written, oral, or multimodal, to present results	

Unit 8		Correlation—Teacher's Guide
(1) Cross-curricular second language acquisition/learning strategies. The ELL uses language learning strategies to develop an awareness of his or her own learning processes in all content areas. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:		
ELPS 1.A	use prior knowledge and experiences to understand meanings in English	U8: p. 223
ELPS 1.B	monitor oral and written language production and employ self-corrective techniques or other resources	
ELPS 1.C	use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary	
ELPS 1.D	speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known)	
ELPS 1.E	internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment	U8: p. 25, U8: p. 135
ELPS 1.F	use accessible language and learn new and essential language in the process	
ELPS 1.G	demonstrate an increasing ability to distinguish between formal and informal English and an increasing knowledge of when to use each one commensurate with grade-level learning expectations	
ELPS 1.H	develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations	U8: p. 36, U8: p. 104, U8: p. 170, U8: p. 198
(2) Cross-curricular second language acquisition/listening. The ELL listens to a variety of speakers including teachers, peers, and electronic media to gain an increasing level of comprehension of newly acquired language in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in listening. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:		
ELPS 2.A	distinguish sounds and intonation patterns of English with increasing ease	
ELPS 2.B	recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters	
ELPS 2.C	learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions	
ELPS 2.D	monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed	

Unit 8		Correlation—Teacher's Guide
ELPS 2.E	use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language	
ELPS 2.F	listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD-ROM to build and reinforce concept and language attainment	
ELPS 2.G	understand the general meaning, main point, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar	
ELPS 2.H	understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations	U8: p. 140
ELPS 2.I	demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs	
(3) Cross-curricular second language acquisition/speaking. The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:		
ELPS 3.A	practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible	
ELPS 3.B	expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication	
ELPS 3.C	speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired	U8: p. 197, U8: p. 212
ELPS 3.D	speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency	
ELPS 3.E	share information in cooperative learning interactions	
ELPS 3.F	ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments	

Unit 8		Correlation—Teacher's Guide
ELPS 3.G	express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics	U8: p. 25, U8: p. 58, U8: p. 85, U8: p. 179
ELPS 3.H	narrate, describe, and explain with increasing specificity and detail as more English is acquired	U8: p. 121
ELPS 3.I	adapt spoken language appropriately for formal and informal purposes	U8: p. 148
ELPS 3.J	respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment	
(4) Cross-curricular second language acquisition/reading. The ELL reads a variety of texts for a variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For kindergarten and grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text. The student is expected to:		
ELPS 4.A	learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words	
ELPS 4.B	recognize directionality of English reading such as left to right and top to bottom	U8: p. 18, U8: p. 96, U8: p. 133
ELPS 4.C	develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials	
ELPS 4.D	use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text	U8: p. 38, U8: p. 56, U8: p. 133, U8: p. 140
ELPS 4.E	read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned	
ELPS 4.F	use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language	U8: p. 18, U8: p. 32, U8: p. 36, U8: p. 102, U8: p. 104, U8: p. 170, U8: p. 195, U8: p. 198, U8: p. 209
ELPS 4.G	demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs	U8: p. 76, U8: p. 77, U8: p. 96, U8: p. 162
ELPS 4.H	read silently with increasing ease and comprehension for longer periods	

Unit 8		Correlation—Teacher's Guide
ELPS 4.I	demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs	U8: p. 76
ELPS 4.J	demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs	U8: p. 56, U8: p. 96, U8: p. 102, U8: p. 133, U8: p. 179, U8: p. 209
ELPS 4.K	demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs	U8: p. 38, U8: p. 162
(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For kindergarten and grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:		
ELPS 5.A	learn relationships between sounds and letters of the English language to represent sounds when writing in English	
ELPS 5.B	write using newly acquired basic vocabulary and content-based grade-level vocabulary	
ELPS 5.C	spell familiar English words with increasing accuracy, and employ English spelling patterns and rules with increasing accuracy as more English is acquired	
ELPS 5.D	edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired	
ELPS 5.E	employ increasingly complex grammatical structures in content area writing commensurate with grade level expectations such as (i) using correct verbs, tenses, and pronouns/antecedents; (ii) using possessive case (apostrophe -s) correctly; and, (iii) using negatives and contractions correctly	
ELPS 5.F	write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired	U8: p. 74, U8: p. 83, U8: p. 115, U8: p. 148, U8: p. 178, U8: p. 214
ELPS 5.G	narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired	U8: p. 23, U8: p. 33, U8: p. 34, U8: p. 135, U8: p. 166, U8: p. 223

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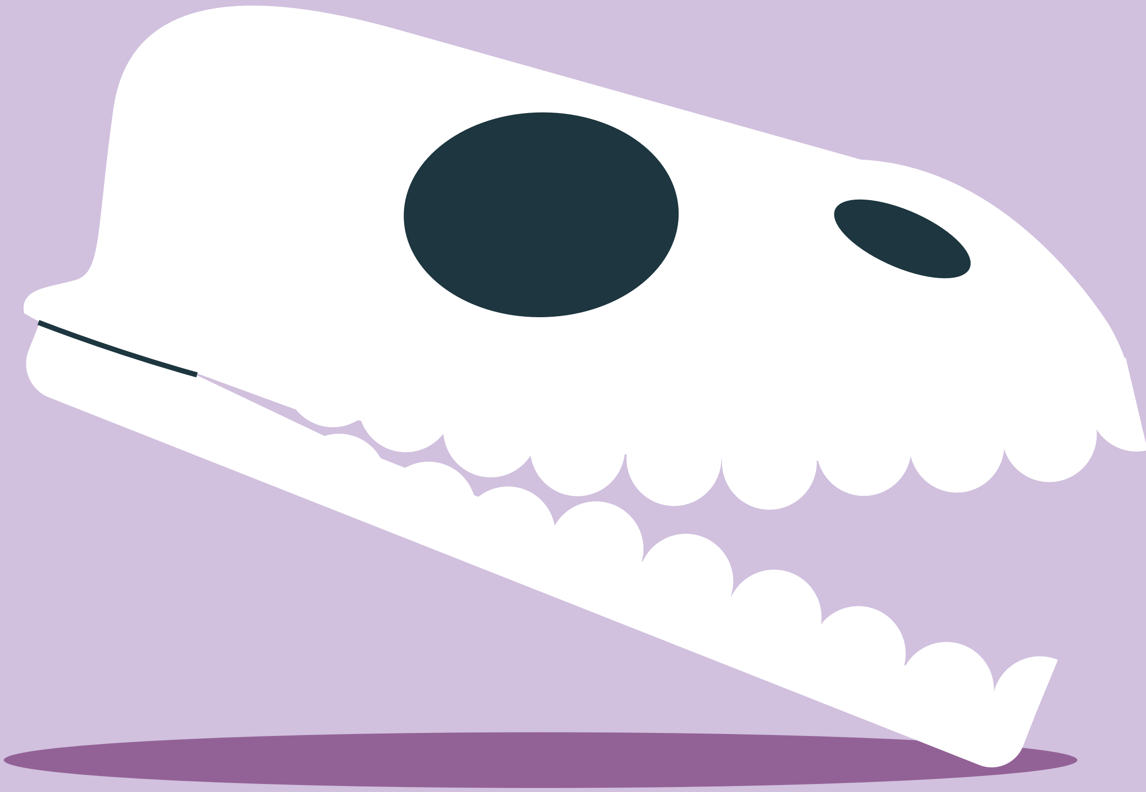

Grade 5

Unit 8 | Activity Book

Chemical Matter: Detectives, Dinosaurs, and Discovery

Grade 5 | Unit 8

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Activity Book

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Unit 8
Chemical Matter:
Detectives, Dinosaurs, and Discovery
Activity Book

This Activity Book contains activity pages that accompany the lessons from the Unit 8 Teacher Guide. The activity pages are organized and numbered according to the lesson number and the order in which they are used within the lesson. For example, if there are two activity pages for Lesson 4, the first will be numbered 4.1 and the second 4.2. The Activity Book is a student component, which means each student should have an Activity Book.

ACTIVITY 1.1

NAME: ______________________ DATE: ______________

WELCOME TO FOSSIL CAMP

Working individually, answer the questions below in the space provided.

1. Below are three images. Which of these is closest to the setting described in the text? Provide quotes from the text to support your answer.

ACTIVITY 1.1

NAME: ______________________ DATE: ______________

2. **Look at the sentences below.** Circle those that you think describe the setting of this text. In each case, provide a word or term in the text that supports your answer.

   "Lonely and empty"

   "An extraordinary edifice made by man"

   "Shaped by rain and storms"

   "Chains of rocky hills that have almost no plants or life on them"

   "Lush and green"

Challenge

1. The badlands are the setting for this story. Does that mean the tents are not the setting? Give reasons for your answer.

2. Why do you think the text spends so much time describing the setting? What effect does that have on you, the reader?

ACTIVITY PAGE 1.2

NAME: ______________________________ DATE: ______________

VOCABULARY

Working as a class, complete the table below, using Chapter 1 of the *The Badlands Sleuth* for your answers.

TERM OR IDEA	DEFINITION OR EXPLANATION
Matter	
States of Matter	
Physical Property	
Mass	

NAME: ______________________________ DATE: ____________

EXAMPLES FROM TEXT	OTHER EXAMPLES

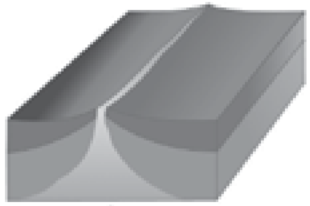
ACTIVITY PAGE 1.3

NAME: ______________________ DATE: ____________

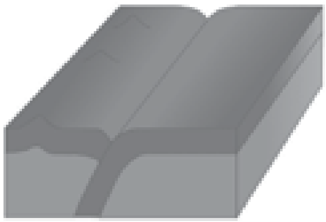
Think of an object that qualifies as matter. Using the table you created in Activity Page 1.2 as a guide, describe the properties of the object, just as a scientist would. But don't name or identify the object! As you write, think about how to organize your information.

THE CHANGING EARTH—GEOLOGY READER

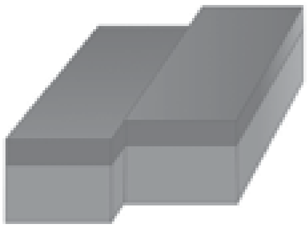
A Matter of Time


Tectonic plates move apart.

At some boundaries, tectonic plates are moving apart. As the plates separate, molten rock flows up from the mantle into the space between them, creating new crust. Mid-ocean ridges are an example of this type of plate interaction. Tectonic plates along the mid-ocean ridge in the Atlantic Ocean are moving apart at a rate of about 0.8 to 2 inches per year. That may not seem like much, but it adds up. Two hundred million years ago, the landmasses of North America and Europe were joined. So were South America and Africa. Thanks to separating plates, these continents now lie on opposite sides of a vast ocean.


Tectonic plates collide.

At other plate boundaries, tectonic plates are **colliding**, or crashing together. In some places, colliding plates slowly crash into each other. The crust at their edges gradually crumples and is pushed higher and higher, creating mountains. In other places, one of the colliding plates slides under the other. Two plates are colliding this way along the western coast of South America. A heavier oceanic plate is sliding under a lighter continental plate. Scientists call this process **subduction**. Subduction has created a deep ocean trench off the coast of Chile and Peru. It has also had a role in creating the towering Andes Mountains along the western edge of South America. Similar plate interactions have formed mountain ranges throughout Earth's long history.


Tectonic plates slide sideways past one another.

Finally, tectonic plates slide sideways past one another. It's never a smooth process. Plate edges press together hard. They often get stuck while the

20

ACTIVITY PAGE 1.4

pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Wegener's Pangaea broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.

As plates move, interesting things happen. Most of the time, they happen incredibly slowly. Sometimes, though, the effects of plate movements are sudden and dramatic. Think earthquakes and volcanoes!

Core Conclusions

You may never have heard of the Danish scientist Inge Lehmann. Among seismologists, however, she is famous. Around 1900, scientists thought the earth had just three layers: an outer crust, a solid mantle, and a liquid core. Lehmann studied seismograph records of earthquakes. She analyzed how seismic waves changed as they traveled through Earth's interior. Lehmann collected thousands of records organized in boxes—there were no computers back then! She saw patterns in how seismic waves behaved as they moved through Earth. Lehmann concluded that Earth's core has two parts: a liquid outer core and a solid inner core. In 1936, she announced her findings and changed our view of Earth!

21

NAME: ______________________________ DATE: ______________

Look again at the second half of Chapter 1 of *The Badlands Sleuth*. In your pairs, compare this text with the Geology text and provide reasons why you might consider *The Badlands Sleuth* text either informational or literary. Give specific examples in your answer.

Reasons the Text Is Informational Like the Geology Text

Like the Geology text, it: ______________________________

____

____

____

For example: ______________________________

____

____

Unlike the first half of Chapter 1 of *The Badlands Sleuth*, it:

____

____

____

For example: ______________________________

____

____

ACTIVITY PAGE 2.1

NAME: ______________________ DATE: __________

Reasons the Text Is Literary Like the First Half of the Chapter

Like the first half of the chapter, it: ______________________

____

____

____

For example: ______________________

____

____

Unlike the Geology text, it: ______________________

____

____

____

For example: ______________________

____

____

NAME: ______________________________ DATE: ______________

Which Is It?

Do you think this text should be classed as narrative or informational? Use your examples above to provide an answer. (If you disagree with your partner, it is OK for you to write something different.)

ACTIVITY PAGE 2.2

NAME: ____________________ DATE: __________

WRITE A NARRATIVE CONTAINING INFORMATIONAL CONTENT

Your task is to rewrite the Geology content in Activity Page 1.3 in the narrative form of *The Badlands Sleuth*.

AS YOU WRITE, YOU SHOULD CONSIDER:

- The characteristics of the text you identified the previous day. What does the "narrative form" of *The Badlands Sleuth* mean?
- The content. Although you are rewriting in narrative form, the content must still be accurate and clear.
- What you need to include. You cannot copy and paste all the information—you should choose what to present and how, while explaining the main ideas in the text.
- Your setting and plot. Be as imaginative as you like! If you wish, you can also use devices from *The Badlands Sleuth*—for example, the author used questions from the campers to provide a context for the information Tess provides.
- You should plan out your work for at least five minutes before you write—think about the organization of the text and your plot!

ACTIVITY PAGE 2.2

NAME: ______________________ DATE: ____________

ACTIVITY 2.3

NAME: ______________________ DATE: ______________

EXPAND THE SENTENCES

Expand the sentences below. Think about descriptive details you can add, and what additional information they will provide the reader. You might want to brainstorm some adjectives first. Remember, you should still have only one sentence at the end.

1. Amy walked into her tent

2. Matt listened to Tess's explanation

3. I drove round the rocks

NAME: ______________________________ DATE: ________________

–ment: Suffix Meaning State Of Being

Choose the correct word and combine it with the suffix –*ment* to complete the sentence.

1. Winning the Nobel Prize was a great ____________________________.
   (amaze, achieve, align, excite)

2. The idea of finding a new fossil caused great _________________________.
   (disagree, judge, entertain, excite)

3. After 45 years of work, Mr. Smith was looking forward to _______________________.
   (pay, accomplish, move, retire)

4. I want to be a police officer because I'm interested in

   law ___________________________.
   (endear, encourage, enforce, entertain)

5. With a glow of ___________________________ in his eyes, Matt ran down the beach.
   (achieve, align, excite, entertain)

Challenge:

Write three sentences using a word with the suffix –*ment*. They can be about anything!

____

____

____

ACTIVITY 2.5

NAME: ______________________ DATE: ______________

ANALYZE DETAILS

In pairs, answer the questions below. After answering each question, say whether you think the text detail is literary or informational, and why.

Question	Answer	Is this a literary or informational detail? Give reasons for your answer.
What series of steps are required to excavate the bones?		
What clue do you get about Julian's personality from his questions?		
Why does Daria say she wants her phone, and why does she really want it?		

ACTIVITY 3.1

NAME: ______________________ DATE: ______________

Can you be a dinosaur detective?

Read the clues below and see if you can decipher the origin of the dinosaur's name.

- Acheroraptor temertyorum was found in Hell's Creek in Montana.
- In Greek mythology, there is a river in the underworld called Acheron. The Greeks did not have hell–but they did have the underworld, where people were punished or rewarded depending on their lives.
- Raptor comes from the Latin word raptere, which means "to plunder or steal."
- James and Louise Temerty have been major supporters of the University of Ontario, where the dinosaur is displayed.
- Sometimes paleontologists, or those who supported or funded their work, get new fossils named after them.

My Theory

1. They used the name **Acheroraptor** because

____

____

____

2. They used the name **temertyorum** because

____

____

____

NAME: ______________________________ DATE: ______________

THE WATER CYCLE

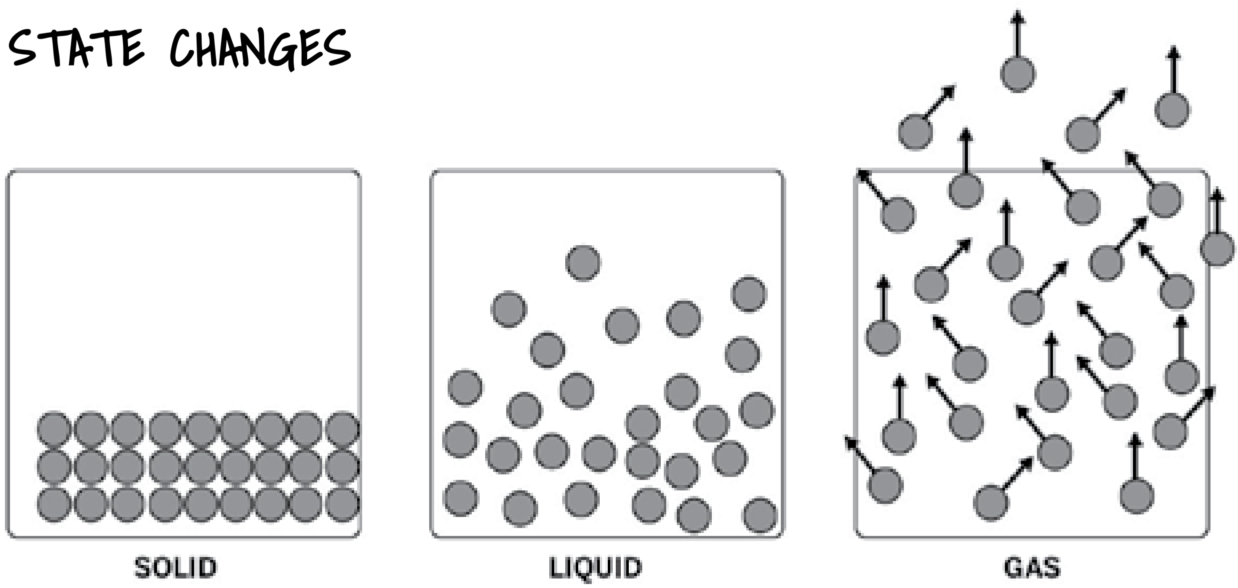
The diagram shows a water cycle–which describes how water moves around the earth in different states.

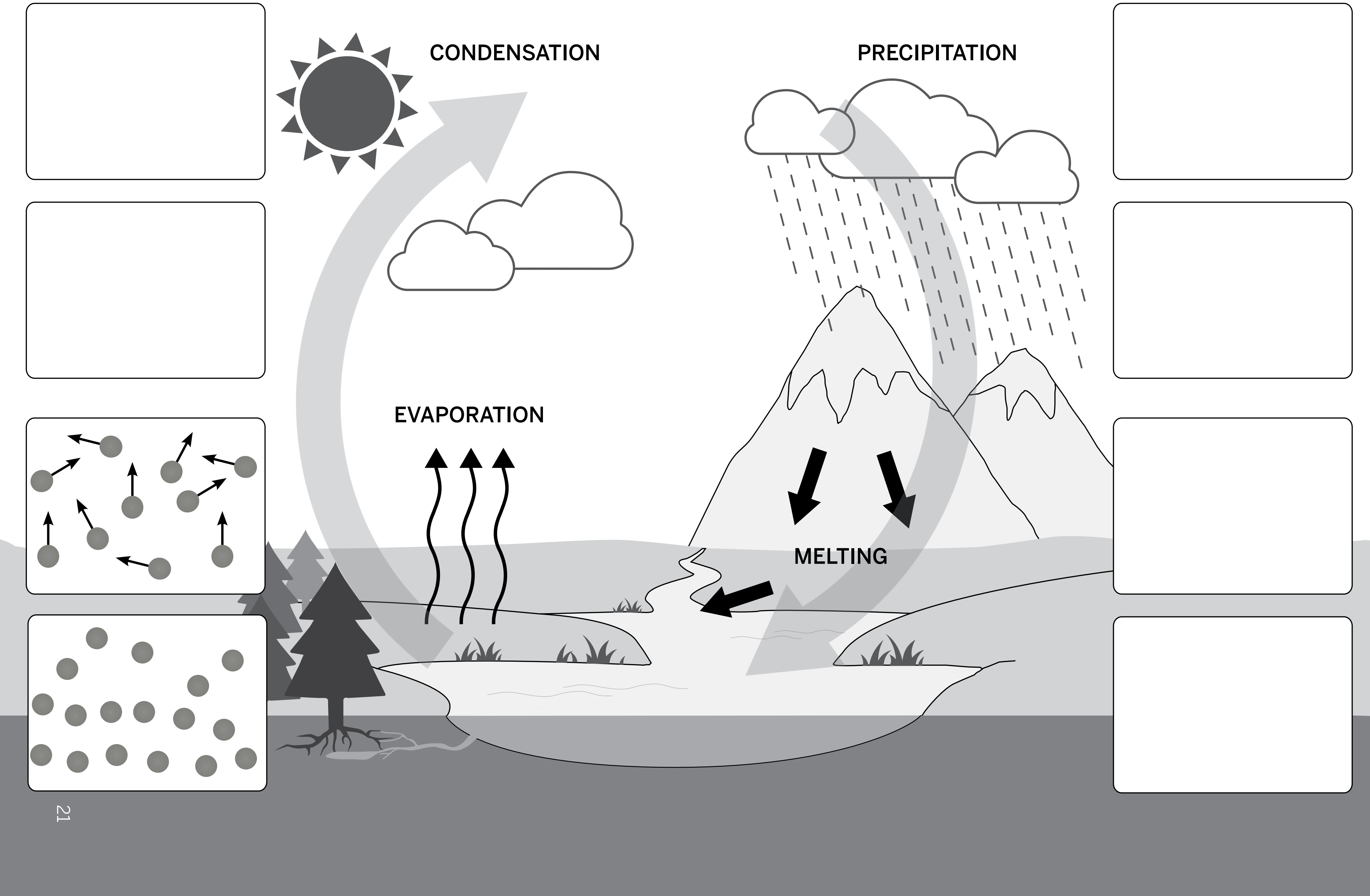
Using the content from the Reader, and the diagrams on the following page:

1. Annotate this diagram by describing how water changes state through the cycle.
2. Draw the appropriate diagrams next to each part of the water cycle to show the changes in state. Draw arrows between them to show the change that is occurring.

The first example has been completed for you.

STATE CHANGES




CONDENSATION
PRECIPITATION
EVAPORATION
MELTING

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

CHARACTER MAPS

AMY

NAME: ____________________ DATE: ______________

AMY

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

TESS

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

TESS

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

JULIAN

NAME: ______________________ DATE: ______________

JULIAN

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

KRISTAL

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

KRISTAL

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

DARIA

NAME: ______________________ DATE: ______________

DARIA

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

FELIX

NAME: ______________________ DATE: ______________

FELIX

ACTIVITY 3.3

NAME: ______________________ DATE: ____________

SQUIRRELS

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

SQUIRRELS

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

SUV

ACTIVITY 3.3

NAME: ______________________ DATE: ______________

SUV

ACTIVITY PAGE 3.4

NAME: ______________________________ DATE: ______________

TESS'S RULES FOR OBSERVATION

When I started studying chemistry, the first thing I had to learn was how to notice things properly. My rules for observation are:

1. Look carefully at everything.
2. Record what you can: mass, color, texture, state.
3. Look at how things change. If you heat it up, what happens? If you add another substance, what happens?
4. Ask, "Does what I observe match the theory?" Great scientific discoveries happen when scientists notice things not behaving the way they thought those things would. Do you see anything strange?
5. If you have a theory, test it across as many examples as you can. The more evidence you have to back up your ideas, the better.

TRY APPLYING THE RULES TO THIS EXAMPLE:

If I wanted to understand the properties of salt, I would

____

____

____

INSPECTOR ELLIS'S RULES FOR DETECTION

There's a reason I'm Amy's favorite detective. I am brilliant. No case goes unsolved if Inspector Ellis is called in (well, there was that one case with the umbrella and the penguin, but I don't like to talk about it).

Obviously, you can't become as brilliant as I am (Did I mention I was brilliant?) overnight. But you can start down the long, lonely path of becoming a great detective by following my rules of observation.

1. Look at everything. Write down what you see.
2. Collect what you can and analyze it—fingerprints, lipstick stains, everything (you can send it to the chemistry people in the lab).
3. If you've seen the crime scene before, compare what you see now with what you saw before.
4. Does anything seem out of place or unusual?
5. Interview everyone. Do their stories match up? Does anything seem out of place?
6. Is anyone behaving strangely? You can't arrest someone for being nervous, but it might give you an idea of what to look for and where.
7. Do you have a theory? Can you test it? For example, in my last case, I thought it was possible the thief had stolen out through an air vent. I tested if this was possible by sending my sidekick through the vent. I was wrong, and my sidekick became stuck, but I'd never have known this without testing my theory! (He quit later; some people can't cope with the challenge of this job.)

ACTIVITY 4.1

NAME: ______________________ DATE: ______________

As you read Chapter 4 in your pairs, one of you should answer the Detective questions below, and the other the Scientist questions. When you have finished, explain and discuss your answers with your partner.

Detective Questions:

1. What are we told about Dr. Forester that indicates she isn't "very happy"?

____

____

2. What did Kristal do that indicated she was "secretive" about her drawings?

____

____

____

3. What further evidence do we have that Dr. Forester is upset?

____

____

Challenge: Why does this suggest she is upset?

4. What information have we been given about Amy that tell us why she "tingles" when she hears the word *mystery*?

____

____

NAME: ______________________________ DATE: ______________

SCIENTIST QUESTIONS:

1. How was matter defined in earlier chapters?

____

____

SUPPORT:

The answer is in the second half of Chapter 1.

2. How has Tess added to the definition of matter?

____

____

3. What are different kinds of atoms called?

____

____

4. How do scientists arrange the elements?

____

____

ACTIVITY PAGE 4.2

NAME: ______________________________ DATE: ______________

PART 1.

Working in your small groups, find each of the elements mentioned by Tess on page 26 of the Reader in the periodic table. Note their chemical symbols and circle them in the periodic table below.

Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2								
							1 **H** hydrogen 1		
7 **Li** lithium 3	9 **Be** beryllium 4								
23 **Na** sodium 11	24 **Mg** magnesium 12								
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110

** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.*
The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

NAME: ______________________________ DATE: ______________

		3	4	5	6	7	0
							4 **He** helium 2
		11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
		27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

ACTIVITY PAGE 4.2

NAME: ______________________________ DATE: ______________

PART 2.

Now read the text again carefully and list the differences between metals and nonmetals that Tess describes. The first example has been completed for you.

METALS	NONMETALS
Resonant: *make a ringing sound*	***Nonresonant:*** *don't make a ringing sound*

NAME: ______________________ DATE: __________

PART 3.

Now read the descriptions of the elements below. Find the elements in the periodic table, and label whether you think they are metals or nonmetals from the descriptions in the text.

1. My little brother stole my mom's gold wedding ring while she was washing up. Next thing I knew, he was pounding it flat with a rock in the back garden! There was mud all over it, so it wasn't as shiny as normal. I managed to rescue it and take it back to her. It made a sad clinking sound when I placed it on the counter.

   Name of the element: ______________________

   Characteristics described: ______________________

   Metal or nonmetal? ______________________

2. Carbon is one of the most amazing elements: it is the source of all life on our planet. But it doesn't look like much. It's dark and dull, and crumbles when you press it too hard. You can't make it into shapes or wires.

   Name of the element: ______________________

   Characteristics described: ______________________

   Metal or nonmetal? ______________________

ACTIVITY PAGE 4.2

NAME: ______________________________ DATE: ______________

3. When you peel back the plastic, you can see the shiny brown wire underneath, glistening in the light. It's amazing that something so thin makes all of our lights, and the toaster, and other things in the house work. Apparently the wire is made of copper, which was discovered 11,000 years ago. I don't know why we don't make more jewelry out of it—it's so pretty.

   Name of the element: ______________________________

   Characteristics described: ______________________________

   Metal or nonmetal? ______________________________

4. Sulfur is not my favorite element. When it reacts it releases a horrible rotten-egg smell. As a solid, it's yellow and brittle. It doesn't make a nice sound when you hit it (in fact, it crumbles).

   Name of the element: ______________________________

   Characteristics described: ______________________________

   Metal or nonmetal? ______________________________

CHALLENGE:

Can you come up with your own examples from elements you recognize in the periodic table?

____

____

____

NAME: ______________________ DATE: ______________

COMBINE SENTENCES

Combine the following sentences:

1. The dinosaur roared. It started running toward us.

____

____

2. Amy was careful when lifting the egg from the dig. The egg was many thousands of years old.

____

____

____

3. Amy might have looked bored. She was really excited.

____

____

ACTIVITY 4.3

NAME: ______________________ DATE: ______________

Reduce the following sentences:

1. The fox, which was quick and colored brown, jumped over the dog, which was lazy and didn't bother to get up.

   ____

   ____

   ____

2. The pizza, cold and clammy to the touch, made Felix grimace when he ate it.

   ____

   ____

   ____

NAME: ______________________ DATE: ______________

Challenge:

Can you come up with your own examples?

____

____

____

____

ACTIVITY 4.4

NAME: ______________________ DATE: ______________

SUMMARIZING EVENTS

The Sheriff has heard some tales of strange happenings at the dig site and asked one of his junior policemen to compile a report to see if there's anything worth investigating.

Your job is to summarize the events that have befallen the campers so far, making particular note of who did what, and went where.

Your teacher will model taking notes to summarize the events for your police report from the first day for the campers. As she works, write notes with her in the space below.

When	Who	Where
Day 1–on the way to camp		
Day 1–on the way to camp		
Day 1–at the camp		
Day 1–at the camp		
Day 1–at the dig site		

ACTIVITY 4.4

NAME: ______________________ DATE: ______________

Description	Incidents?

ACTIVITY 4.4

NAME: ______________________ DATE: ______________

EVENTS

Now complete the table for Chapter 2 in your pairs. One of you will complete the first half of the table, and the other the second half of the table.

Partner I

When	Who	Where
Chapter 2— at the dig site		

NAME: ______________________ DATE: ______________

Description	Incidents?

ACTIVITY 4.4

NAME: ______________________ DATE: ______________

Partner 2

When	Who	Where

ACTIVITY 4.4

NAME: ______________________ DATE: ______________

Description	Incidents?

Challenge

See how well you remember the events. Ask your partner to name a character, and see if you can recount all of his or her movements without looking at your table.

ACTIVITY 5.1

NAME: ______________________ DATE: ______________

POLICE REPORT

In the space below, write a first draft of the police report to the sheriff.

Remember to:

- Concisely summarize the events.
- Make sure the sheriff can easily find the most important information.
- Be objective and state only facts.

NAME: ______________________ DATE: ______________

Now that you have shared and discussed your work, write below how you would revise your police report on the basis of feedback you have received.

I would revise my police report by:

1. ______________________________

____

____

2. ______________________________

____

____

3. ______________________________

____

____

ACTIVITY 5.2

NAME:______________________ DATE:______________

Article 1

What is the Investigation Process?

-The Metropolitan Police (the police force of London).

The information below briefly outlines the many stages of a police investigation.

1. **Initial investigation–**this will involve a review of witnesses, scenes, and all other available evidence.
2. **Investigative assessment–**after the initial investigation a decision will then be made whether to transfer the crime to an investigating officer for further investigation or not. This assessment will take into account the following:
   - Seriousness of the offense
   - Likelihood of solvability (e.g., availability of evidence)
   - Level of resources required proportionate to the seriousness of the offense

   There are two possible outcomes at this point.

   a) **Investigation will be closed**

   b) **Crime transferred for further investigation**

3. **Further investigation–**if the crime is transferred for further investigation this will include:
   - Taking statements from the victim and any witnesses
   - Arresting and detaining any identified suspects and formally interviewing them at a police station

   At the end of the investigation there are three possible outcomes for the suspect(s).

   a) **Charged–**the suspect is told that they will be sent to court and what law they are alleged to have broken.

   b) **Cautioned–**an official warning is given in some circumstances.

   c) **No further action–**if there is insufficient evidence to charge or caution a suspect, no further action will be taken.

NAME: ______________________ DATE: ______________

Question:

Are there any arguments from this article you would like to use?

____

____

____

Article 2

Preventing crime better than catching offenders

- Daily Telegraph 29 April 2013

The chief inspector for England and Wales suggested police forces would get "more bang for their buck" if they focus on prevention rather than cure . . .

. . . Mr Winsor, said the "primary purpose" of police is crime prevention.

"Sir Robert Peel who founded the modern police service in 1829, said the primary test of police efficiency is the absence of crime and disorder," he said.

"If we can prevent offences taking place we prevent there being any victims, which is absolutely critical, and also we save all of those costs . . . ."

Question:

Are there any arguments from this article you would like to use?

____

____

____

ACTIVITY 5.3

NAME:______________________________ DATE:________________

Now that you have read the resources, prepare a statement below making your case to your partner. It can be just a few sentences. Remember you are trying to persuade your partner that you are right.

Remember a good opening statement:

- is clear.
- makes your argument.
- is "punchy" and compelling. You can use stories, for example, to make your argument.

Cite evidence from the Reader or one of the two articles to support your argument.

I think there should/should not be an investigation because

____

____

____

____

____

____

____

NAME: ______________________ DATE: ______________

DEBATE ON THE SHERIFF

If you are playing the Sheriff, use the rubric below to judge the two police officers. Fill it in as they debate.

	Police Officer I (name: ______________) Arguing for an investigation	**Police Officer 2** (name: ______________) Arguing against an investigation
Was the person speaking clearly and maintaining eye contact?	Y / N	Y / N
Did they use evidence from the text in their argument? How many pieces?	Y / N Number: _____	Y / N Number: _____
Did they use evidence from the other articles in the other resources?	Y / N	Y / N
Did they use other techniques—stories for example—that made their argument more compelling?	Y / N Please give details.	Y / N Please give details.

ACTIVITY 6.1

NAME: ______________________________ DATE: ________________

As you read Chapter 4 in your pairs, complete the questions below. One of you should complete the questions for Julian and the other for Kristal. You will then use the answers to these questions to continue to develop your character maps from Lesson 3 (Activity Page 3.3).

JULIAN

How does Julian feel when he is told his discovery isn't gold? Quote from the text.

____

Why does Julian feel this way? Can you point to clues about Julian's personality from other chapters to help you answer?

____

____

Challenge:

Why might Julian not wish to look for small fossils anymore?

____

____

____

ACTIVITY 6.1

NAME: ______________________ DATE: ______________

KRISTAL

Why did Kristal's eyes go "wide with surprise"?

____

____

Why is Kristal worried about people seeing her drawings?

____

____

What do you think Kristal's reluctance to show her drawings tells us about her character?

____

____

Language Challenge

Now answer the following questions in your pair.

The text says Amy's mind keeps "wandering." Wander is another word for walk. What kind of literary device is it to say that Amy's mind is wandering?

____

What is the link between the literal and the metaphorical definition of something "wandering"?

____

____

ACTIVITY PAGE 6.2

NAME: ______________________ DATE: __________

In your pairs, read below the paragraphs from the Reader and answer the questions about the text.

1. He cleared his throat and suddenly turned to Tess. "I was wondering, Tess, just what is the difference between gold and fool's gold?"

   Amy thought Felix just asked the question to turn her attention away from him.

   Tess didn't notice, though, and was happy to answer it. "Remember that atoms are the smallest particles of matter. The thing is, you don't find many atoms all by themselves in nature. Atoms typically join together, or bond as chemists say, into groups of two or more to form molecules. Some molecules are made up of atoms of just a single element. A lump of gold, for example, would be made up of many gold atoms bonded together."

   How are atoms usually found in nature?

   ____

   ____

   ____

ACTIVITY PAGE 6.2

NAME: ______________________________ DATE: ______________

2. "Most molecules, though, are combinations of two or more different elements. A molecule of iron pyrite, for example, has two atoms of the element sulfur bonded to an atom of the element iron. Molecules that contain atoms of two or more different elements are called compounds. Water is another example of a compound. A water molecule is made up of two atoms of the element hydrogen and one atom of the element oxygen."

   Are molecules usually made up of one element or more than one? What are molecules made up of more than one element called?

   ____

   ____

   ____

   ____

ACTIVITY PAGE 6.2

NAME: ______________________ DATE: __________

3. "Is that why people sometimes call water 'H-2-O'?" Daria asked.

   "Precisely," Tess replied. "There are millions of molecules that are compounds and you can find them everywhere and in everything. This sandstone rock we're scratching away is made of molecules that are compounds. So are these dinosaur fossils, and the tools we're using. Each one of you is a walking, talking collection of different compounds that make up your bones, muscles, nerves, and everything else in your bodies."

   Why is Daria "precisely" right?

   ____

   ____

4. Dr. Forester suddenly spoke up. "Okay, here's a riddle: why are all compounds molecules, but all molecules are not compounds?"

   "Because some molecules are made up of atoms of only one element!" Matt exclaimed triumphantly.

   "Exactly right," Dr. Forester said.

   Why is Matt "exactly right"?

   ____

   ____

   ____

NAME: ______________________________ DATE: ______________

As your teacher summarizes the first paragraph in Activity Page 6.2, copy his or her summary below.

Now work in your pairs to summarize paragraphs 2 and 3 below.

Remember to think about:

- Whether the information is chemical content.
- Whether you really need the information to understand the content.
- **Hint:** Examples might be helpful, but it is not necessary when summarizing to include them all.

ACTIVITY PAGE 6.4

NAME: ______________________________ DATE: ______________

INTEGRATE INFORMATION

Use the information you summarized from the text and the following clues to identify the following molecules.

CLUES

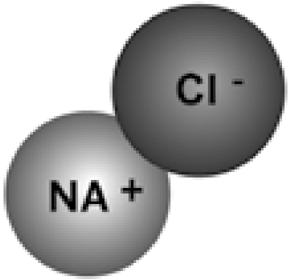
1. Copper is an element found bonded to other copper atoms in a lattice.
2. Salt is a very common and simple compound made of one atom of sodium bonded to one atom of chlorine.
3. Glucose, the sugar in our bodies, is a complex molecule. It is made up of carbon, hydrogen, and oxygen.
4. Do you know why water is called H_2O?

You may also wish to use your periodic table, found on Activity Page 4.2.

ACTIVITY PAGE 6.4

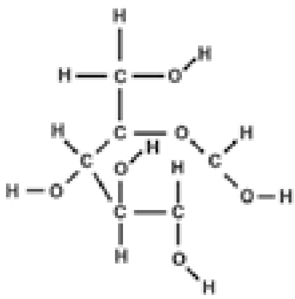
NAME: ______________________ DATE: __________

COMPOUNDS



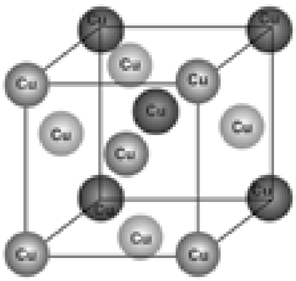
This molecule is ______________________

It is a(n)______________________



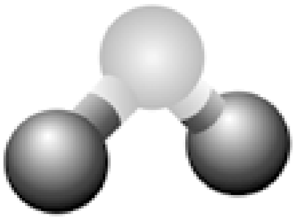
This molecule is ______________________

It is a(n)______________________



This molecule is ______________________

It is a(n)______________________



This molecule is ______________________

It is a(n)______________________

ACTIVITY 6.5

NAME:_______________ DATE:_______________

COMMAS

With the sentences below, circle the subject of the sentence and then insert a comma after the introductory element.

1. To find the clues Amy had to get up very early in the morning.
2. Sensing something was wrong Matt decided to call his sister.
3. With a gulp and a glance at Felix Julian approached the snake.

ACTIVITY PAGE 7.1

NAME: ______________________ DATE: __________

Answer the questions below as you read the first half of Chapter 5.

1. What is a mixture?

____

____

____

2. Tess says that however much you stir a mixture, the physical properties do not change. Name examples of physical properties that do not change. (Hint: Look back at the second half of Chapter 1 in the Reader.)

____

____

____

3. Imagine a container with sugar dissolved in water. Can you use the information you learned about evaporation to explain how sugar crystals might be left behind if the container were left outside on a hot day? (Hint: Sugar does not change state until it is much hotter than a hot day would make it.)

____

____

____

____

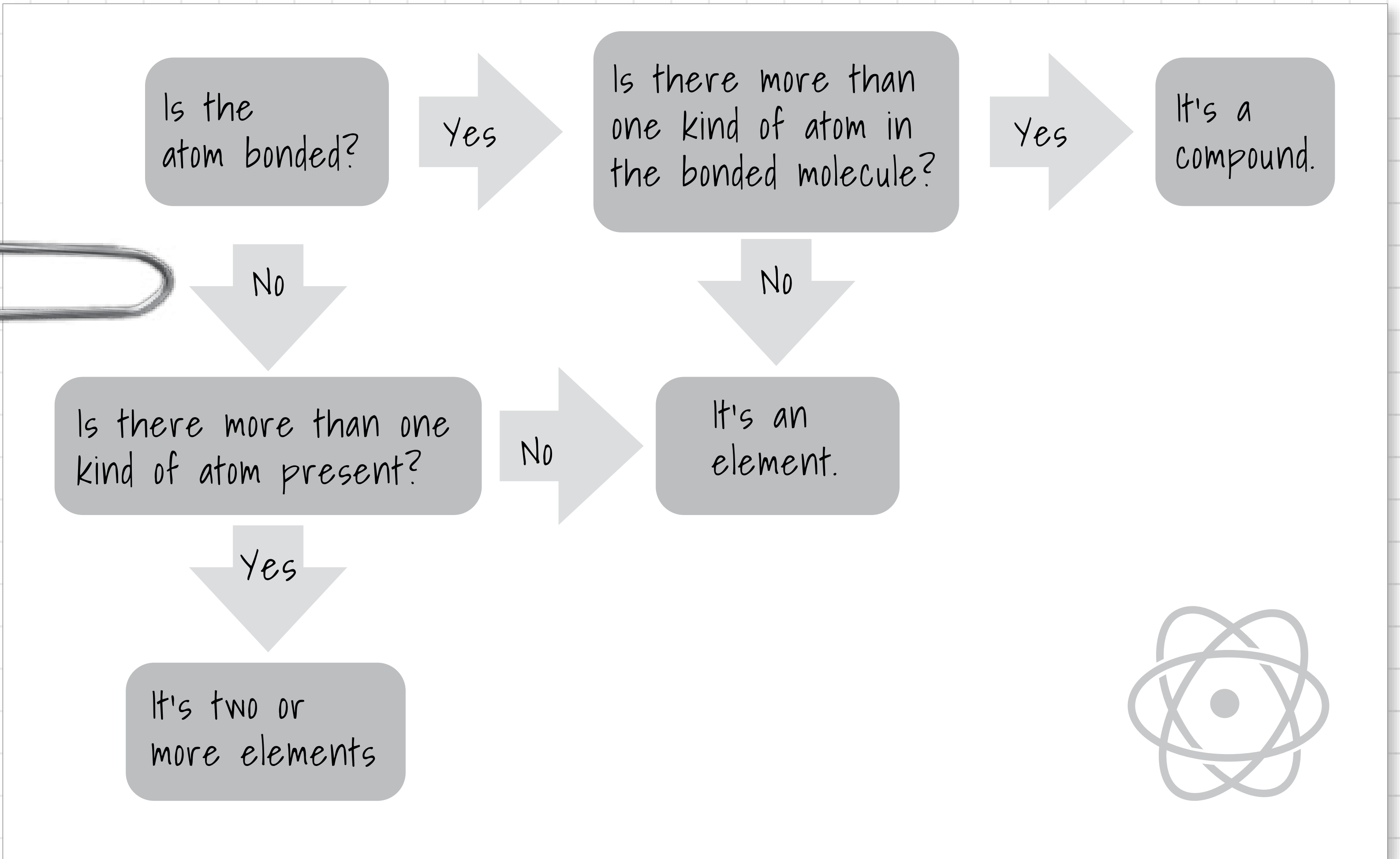
NAME: ______________________ DATE: __________

"TESS'S RULES"

Scientists have to be very precise about their terms and concepts. I can't say something is a solution when really it's a compound. All sorts of terrible things might happen! For example, for medicines to be safe and effective we need to know exactly what kinds of elements, compounds, mixtures, and solutions are being used.

Below are my rules for deciding if something is an element or a compound. I devised my rules by asking myself the following questions:

- Can people use this rule to answer the question, "Is something an element or a compound?"
- Is it possible to decide the answer to the question I ask in each case?
- Is the chart organized in a way that is easy to understand and use?



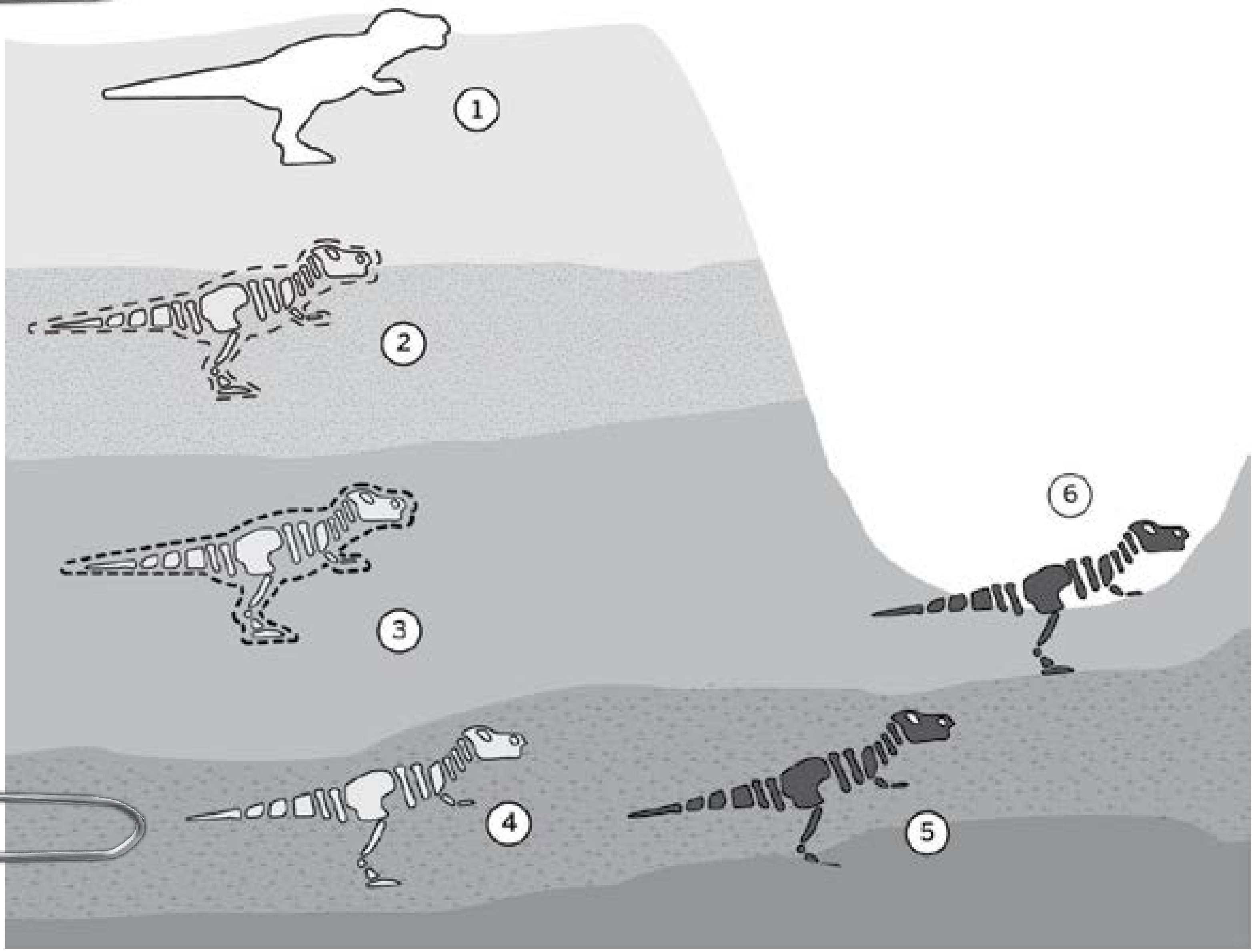
NAME: ______________________________ DATE: ____________

In the space below, create your own "Tess's Rules" for distinguishing between a mixture, a solution, and a compound.

NAME: ______________________________ DATE: ____________

Look at the diagram below. Place quotes from the Reader text on the next page under the relevant number ("as the bones slowly decay . . .") to explain in more detail what is occurring. Examples from the text for an earlier section have been completed for you.

How Fossils are Formed



NAME: ______________________ DATE: __________

1. The animal dies.
2. The remains of the body start to rot and get covered with mud.

   "His body was covered beneath a thick layer of muddy sand."
3. Over time, layers of sediments cover the bones.

   "It was preserved for a long time, sealed beneath tons of sand."
4. The sediments encasing the bones harden into rock.

   ____

   ____

   ____
5. As the bones slowly decay, minerals filter down into space and replace the chemicals in the bones.

   ____

   ____

   ____
6. Layers of rock get worn away by wind and rain (erosion), and a fossil is discovered!

ACTIVITY PAGE 7.3

NAME: ______________________________ DATE: ______________

Now fill in the additional information from the Reader you have found in your "treasure hunt."

LESSON AND ACTIVITY PAGE	WHAT YOU LEARNED	HOW IT HELPS YOU UNDERSTAND FOSSIL CREATION
1.2, 3.2	*Matter can be in different states: liquid, solid, and gas.*	*When water evaporates from liquid to gas, it leaves behind compounds that become the Achy Breaky fossil.*

NAME: ______________________________ DATE: ____________

Use the rubric below as the other small group presents on fossil creation.

	GROUP
Was the person speaking clearly and maintaining eye contact?	Y / N
Did every member of the group get a chance to speak?	Y / N
Did they use evidence from the diagram and Chapter 5 in their presentation? How many pieces?	Y / N Number: ______
Did they use evidence from other chapters in their presentation? How many pieces?	Y / N Number: ______
Did they use other techniques—stories for example—that made their argument more compelling?	Y / N Please give details:

ACTIVITY 8.1

NAME: ______________________ DATE: ______________

Hi, everyone. Your favorite detective is back (that's me, Inspector Ellis, if you were wondering) and here to help you solve the case. It's a pleasure to help when you have a devoted fan like Amy.

It seems pretty clear we have a case on our hands. So we are going to practice making deductions. Don't worry if you're slower than I am—I am brilliant (as I mentioned before). Plus, I've practiced. A lot. You don't become one of the best detectives in the world (probably the best) without investigating a lot of cases.

Amy, who is a brilliant detective in training, has decided that the thief must be "one of us." A dramatic accusation! Our task is to decide if her deductions are correct.

First, let's review Amy's actions in the text. Fill in the table below, starting to read from "Amy was trying to think like Inspector Ellis" (smart girl!) up to "the thief is one of us!" I've done the first example for you.

What Amy did	What Amy saw or said/thought
Added a possibility in her notebook	*Yesterday the soil would have been smoothed by the rain. So if fossil thieves had parked and walked to the camp, there should be clear tire tracks and boot prints.*
Slipped out of camp	
Returns to camp and talks to Matt	

ACTIVITY 8.1

NAME: ______________________ DATE: ______________

Now answer the questions to see if you have been paying attention.

1. What was Amy looking for and what did she find?

2. Amy says “no clue is a clue in itself.” What does she mean?

3. Do you think the evidence supports the theory that there were fossil thieves arriving in an SUV or pickup truck?

4. Do you think Amy’s deduction was correct? Why?

ACTIVITY 8.2

NAME: ______________________ DATE: ______________

OPINION WRITING ON CHARACTER

Answer the question below.

- If you were creating maps for Julian and Kristal, answer for Julian.
- If you were creating maps for Felix and the squirrels, answer for Felix.
- If you were creating maps for Darla and the SUV, answer for Darla.

Look at the information you marked on your character maps that represented Amy's opinion rather than fact. Using that information, answer the following question:

What assumptions has Amy made about your character's behavior?

Do you think those assumptions are valid?

ACTIVITY 8.2

NAME: ______________________ DATE: ______________

ACTIVITY 9.1

NAME: ______________________ DATE: ______________

Use the questions and rubric below to guide you as you think about your presentation.

As You Prepare Your Presentation

Review your character maps, and use the information to structure your presentation using the guidance below.

1. You should begin by introducing your character. Who are they?
2. What important objective information do we know about the character?
3. Does that information point to them being a suspect or not? Or is it impossible to know?
4. What subjective information would you add about the character? Does that change your suspicions?
5. What further evidence would you like the sheriff's permission to look for? How would you like to collect that evidence? For example, you could look for clues, or interview the characters, or check their alibis.

You should also read the rubric in Activity Page 9.2 that students will use as they listen to the presentations. Keep the rubric criteria in mind as you consider what you will say.

NAME: ____________________ DATE: ____________

In the space below, write down notes to help your presentation.

ACTIVITY 9.2

NAME: ______________________ DATE: ______________

PRESENTATION TO SHERIFF

Use the rubric below to judge the reports on the character.
Fill it in as each character is presented.

Question	Characters being presented: Name of student:
Was the person speaking clearly and maintaining eye contact?	Y / N
Did they introduce the character clearly, using information from the text?	Y / N Details:
Did they identify objective information about the character?	Y / N Details:
Did they use that evidence to explain whether the character was a likely suspect?	Y / N Details:

ACTIVITY 9.2

NAME: ______________________ DATE: ______________

Characters being presented: Name of student:	**Characters being presented:** Name of student:
Y / N	**Y / N**
Y / N Details:	**Y / N** Details:
Y / N Details:	**Y / N** Details:
Y / N Details:	**Y / N** Details:

ACTIVITY 9.2

NAME: ____________________ DATE: ____________

Did they identify subjective information about the character?	**Y / N** Details:
Was it clear when evidence was subjective and when it was objective?	**Y / N** Details:
Was it clear what the presenter would like to find out next about the character?	**Y / N** Details:
Did this link to their evidence?	**Y / N** Details:

NAME: ______________________ DATE: ______________

Y / N Details:	Y / N Details:
Y / N Details:	Y / N Details:
Y / N Details:	Y / N Details:
Y / N Details:	Y / N Details:

ACTIVITY PAGE 9.3

NAME: ______________________________ DATE: ______________

Use evidence from the text to answer the questions below.

1. Below is a list of the stages of removing fossil bones. Number the stages in the correct order (so 1 would be the step described first in the text). Circle any steps in which a chemical change is happening.

   ______ Soaking strips of burlap in the plaster.

   ______ Applying more strips on the bottom to create an "egg."

   ______ Mixing plaster of paris with water in a bucket.

   ______ Covering the fossil with the strips of burlap.

   ______ Breaking the plaster with a chisel and hammer.

   ______ Covering fossil with damp paper towels (make sure rock pillar is seen).

2. How does Tess explain the difference between a physical change and a chemical change?

   ____

   ____

   ____

NAME: ______________________________ DATE: ______________

3. What happens in a chemical change?

____

____

____

4. If matter goes through a chemical change, are the physical properties likely to stay the same?

____

____

____

5. Why does the warm bucket suggest a chemical change has taken place?

____

____

____

ACTIVITY PAGE 9.4

NAME: ______________________ DATE: __________

TESS'S RULES

In the space below, create your own "Tess's Rules" for distinguishing between a chemical change and a physical change. Use the rules you created on Activity Page 7.2 to help you.

ACTIVITY PAGE 10.1

NAME: ______________________ DATE: __________

IDENTIFYING EVIDENCE

As you read Chapter 7, note below the chemical changes the campers identify. In each case write down the chemical change and what evidence the camper or Tess offers to demonstrate it's a chemical change. The first one has been completed for you.

CAMPER(S)	CHEMICAL CHANGE	EVIDENCE GIVEN BY CAMPER
Matt and Daria	*wood burning*	*giving off heat and light* *not reversible (can't turn ash into wood)*
Felix and Kristal		
Amy and Tess		
Kristal		

ACTIVITY PAGE 10.1

NAME: ______________________ DATE: ____________

Do you think some of the campers identify better evidence than others? Who do you think made the best case, and who made the weakest? Why? Make sure you quote from the text in your answer.

ACTIVITY 10.2

NAME: ______________________ DATE: ______________

LETTER TO THE SHERIFF

In the space on following page, write a letter to the sheriff explaining the plan to catch the thief. You are hoping he will agree it is a good plan. Remember, the sheriff doesn't know any chemistry, so you will have to explain the physical and chemical changes. If you need help, use the notes in your activity book and the earlier chapters in the Reader to help you. You may find the "Tess's rules" you have created helpful.

Before you write the letter you should consider:

1. The appropriate way to address the sheriff. How should you begin your letter?
2. What evidence you should be presenting to the sheriff to explain why this is a good plan to catch a thief. You should think about the use of objective evidence and subjective evidence when you created your evidence boards. Why is this objective evidence?
3. How you wish to conclude the letter. Remember, you want the sheriff to agree with this plan.

ACTIVITY 10.2

NAME: ______________________ DATE: ______________

There is a graphic organizer on the next page to help you organize your letter.

Write your letter below:

Dear Sheriff,

ACTIVITY 10.2

NAME: ______________________ DATE: ______________

ACTIVITY 10.2

NAME: ______________________ DATE: ______________

Challenge:

Can you come up with other plans to catch the thief using chemical and physical changes? See if you can use the materials around the campsite (like ash, wood, and marshmallows) to come up with a new plan.

You may wish to use the graphic organizer below to help you with your letter.

	Part I: Physical Change	Part 2: Chemical Change
Matter Amy Uses		
What will happen to the matter?		
Why is this a physical/ chemical change? (You may need to refer back to previous notes and chapters.)		
Why does this help catch the thief?		
Why is this objective evidence?		

ACTIVITY 10.3

NAME: ______________________ DATE: ______________

COMMAS

Read the conversation below and **place commas** in the correct places.

"You're a bit grumpy today aren't you" said Matt.

"No I'm just bored" sighed Amy.

Realizing the solution Matt went to the bookshelf and grabbed a detective novel.

"Try this" Matt said.

"Thanks!" responded Amy. "You know me pretty well don't you?" she added.

"Yes I guess I do" said Matt grinning.

ACTIVITY 10.4

NAME: ______________________________ DATE: ________________

MORPHOLOGY

Write the correct word to complete each sentence.

1. "I waited outside the sheriff's office for about half an hour before he gave me ____________________________ to enter."
   (admission, permission, remission, emission)

2. "The squirrel ____________________________ a loud chirruping sound
   (admitted, emitted, transmitted, permitted)
   before running away."

3. "The man from the SUV ____________________________ he was lost."
   (admitted, emitted, transmitted, permitted)

4. "She was successful in her first ____________________________."
   (missile, mission, remittance, committal)

NAME: ______________________ DATE: ______________

ACCUSATION TO THE SHERIFF

Use the questions below as you decide how to organize your evidence board.

Does the organization of your board:

1. Distinguish between evidence for the character and evidence against the character being the fossil thief?
2. Distinguish between strong or objective evidence and weak or subjective evidence?
3. Allow you to form links between different pieces of information (for example, with lines between pieces of information or color coding)?

Draw in the rectangle below how you plan to organize your board. You can check that it meets your aims before drawing on the board itself.

ACTIVITY 11.2

NAME: ______________________ DATE: ______________

Use the table below to take notes in your group as you look at the evidence boards.

	Motive?
Julian	
Kristal	
Felix	
Daria	
Squirrels	
SUV	

NAME: ______________________ DATE: ____________

Means?	Opportunity?

ACTIVITY 11.3

NAME: ______________________ DATE: ____________

I believe the fossils were stolen by ________________.

I believe this because they had the:

1. Motive

Evidence: ____

____

____

____

Two examples from text: ______________________________

____

____

____

____

2. Means

Evidence: ____

____

____

____

NAME: ______________________ DATE: ______________

3. **Opportunity**

Evidence: ____

____

____

____

Challenge:

Does your "Opportunity" section explain the opportunity to steal the fossils on both occasions?

ACTIVITY 11.4

NAME: ______________________ DATE: ______________

Question
Was the group speaking clearly and maintaining eye contact?
Did they clearly state whom they were accusing?
Did they identify a clear motive, using evidence from the text?
Did they explain how the suspect had the means to commit the crime, using evidence from the text?
Did they explain how the suspect had the opportunity to commit the crime, using evidence from the text?
Was it clear when evidence was subjective and when it was objective?
Do you think the evidence was convincing? Why or why not?

NAME: ______________________ DATE: ______________

Name of suspect accused:
Students in small group:
Y / N
Y / N
Y / N Details:
Y / N Details:
Y / N Details:
Y / N Details:
Y / N Details:

ACTIVITY 12.1

NAME: ______________________ DATE: ______________

Event: What happened?	When did it happen?
"I snuck in here later that night to see them for myself. I'd picked one up to look at it more closely when I thought I heard someone coming, and without thinking I shoved the fossil into my pocket and slipped out the back of the tent."	*at the end of Chapter 2 (the second night at camp)*
"I thought I'd just put the fossil back when no one was looking, and she'd just assume she misplaced it. But every time I tried to do that, either Tess or Dr. Forester was here in the lab."	

ACTIVITY 12.1

NAME: ______________________ DATE: ______________

Why did it happen?	Were there any clues this was happening?
Julian "didn't want to wait" until the morning to see the fossils.	*"I want to look at them!" Julian said, jumping up from his chair and heading for the lab.* *Dr. Forester caught him by the shoulder. "If you don't mind, Julian, let's wait until morning. It's really time for everyone to head for bed."* *Julian shrugged and reluctantly said, "Okay."* *(quote from end of chapter 2)*

ACTIVITY 12.1

NAME: ______________________ DATE: ______________

“Then we found more fossils and Dr. Forester started talking about how great it would be if she could get some of them to fit together. I thought since I had the missing piece that maybe I could use it to figure that out, and maybe it would turn out be an important new discovery.”	
“Once I had the fossils, I couldn’t make any sense of them. I couldn’t even figure out a way to put them back in the lab without getting caught. So I put them in a sack and hid them under a bush.”	
“So last night I brought the fossils back and put them there on the table. It seemed better than being caught with them red-handed or having to admit in front of everyone what I did. I didn’t think much further than that.”	

ACTIVITY 12.1

NAME: ______________________ DATE: ______________

ACTIVITY 12.2

NAME: ______________________ DATE: ______________

	Character *(circle the appropriate one)* **SUV** **squirrels** **Felix** **Daria**	**Character** *(circle the appropriate one)* **SUV** **squirrels** **Felix** **Daria**
What information do we learn about this character in Chapter 8?		

NAME: ______________________ DATE: ______________

ACCUSATION TO THE SHERIFF

As you work with the teacher, fill in the table below.

	Character's wants	Character's behavior	Character's resolution
Daria	*She misses her mother.*		
Felix			
Squirrels			
SUV			

ACTIVITY 12.4

NAME: ______________________ DATE: ______________

GRAMMAR

1. **Use the word in brackets** to complete the sentence, turning the word into the past perfect tense.

They ate the snacks that Felix ______________________. (provides)

Amy read the letter Inspector Ellis ______________________. (send)

They talked about the case they ______________________. (solve)

I edged away from the snake I ______________________. (spot)

We carefully removed the egg we ______________________. (excavate)

2. **For two of the example sentences above,** can you list the order of the actions in the space below?

____

____

____

____

____

____

ACTIVITY PAGE 13.1

NAME: ______________________________ DATE: ______________

CHAPTER 13

Read Chapter 13 up to "That's absolutely amazing," **and answer** the questions below:

1. Tess says chemical changes are the "ultimate" recyclers. Why do you think she used the word *ultimate*?

   ____

   ____

2. Plants 300 million years ago had bodies built from compounds. What are compounds?

   ____

   ____

3. What element existed in all of those compounds?

   ____

4. Name the chemical changes that converted the plants into a plastic bottle.

   ____

   ____

5. Which of those chemical changes happened without humans and which required humans?

   ____

   ____

ACTIVITY PAGE 13.1

NAME: ______________________ DATE: __________

Now look at the diagrams on the following pages. These refer to the process of plants from 300 million years ago turning into plastic bottles.

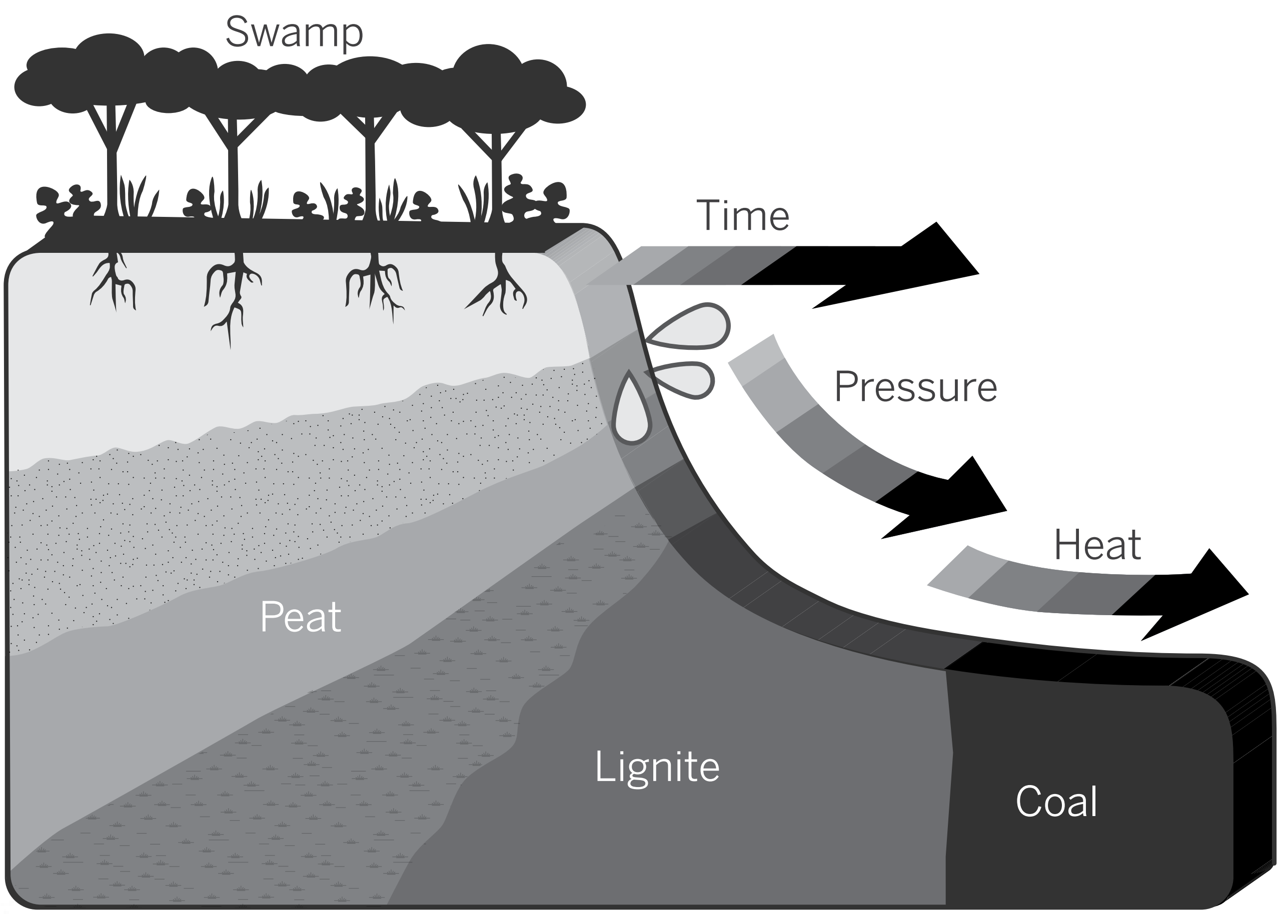
In your pairs, identify the diagrams that explain how plants get turned over time into coal and oil, and then how coal and oil become plastics.

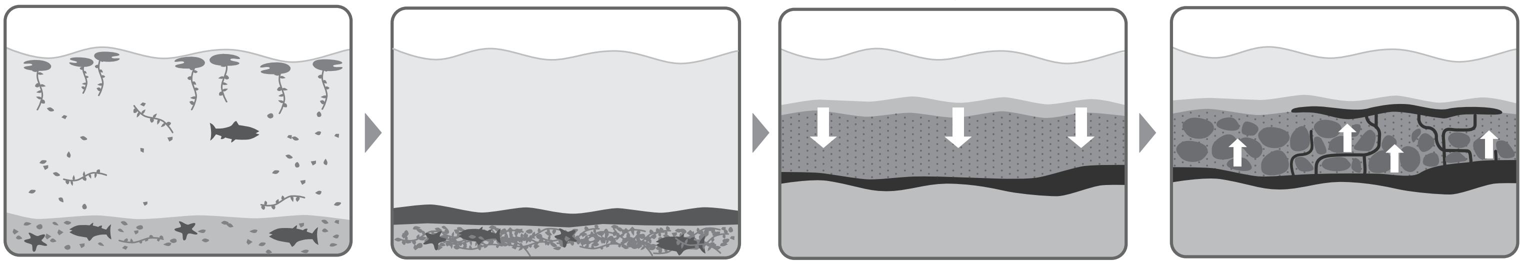
In the space below, replicate the diagrams in the correct order, and annotate them with information from the text to explain how a plant could be turned into a plastic bottle.

NAME: ______________________ DATE: __________

ACTIVITY PAGE 13.1

NAME: ______________________ **DATE:** ____________

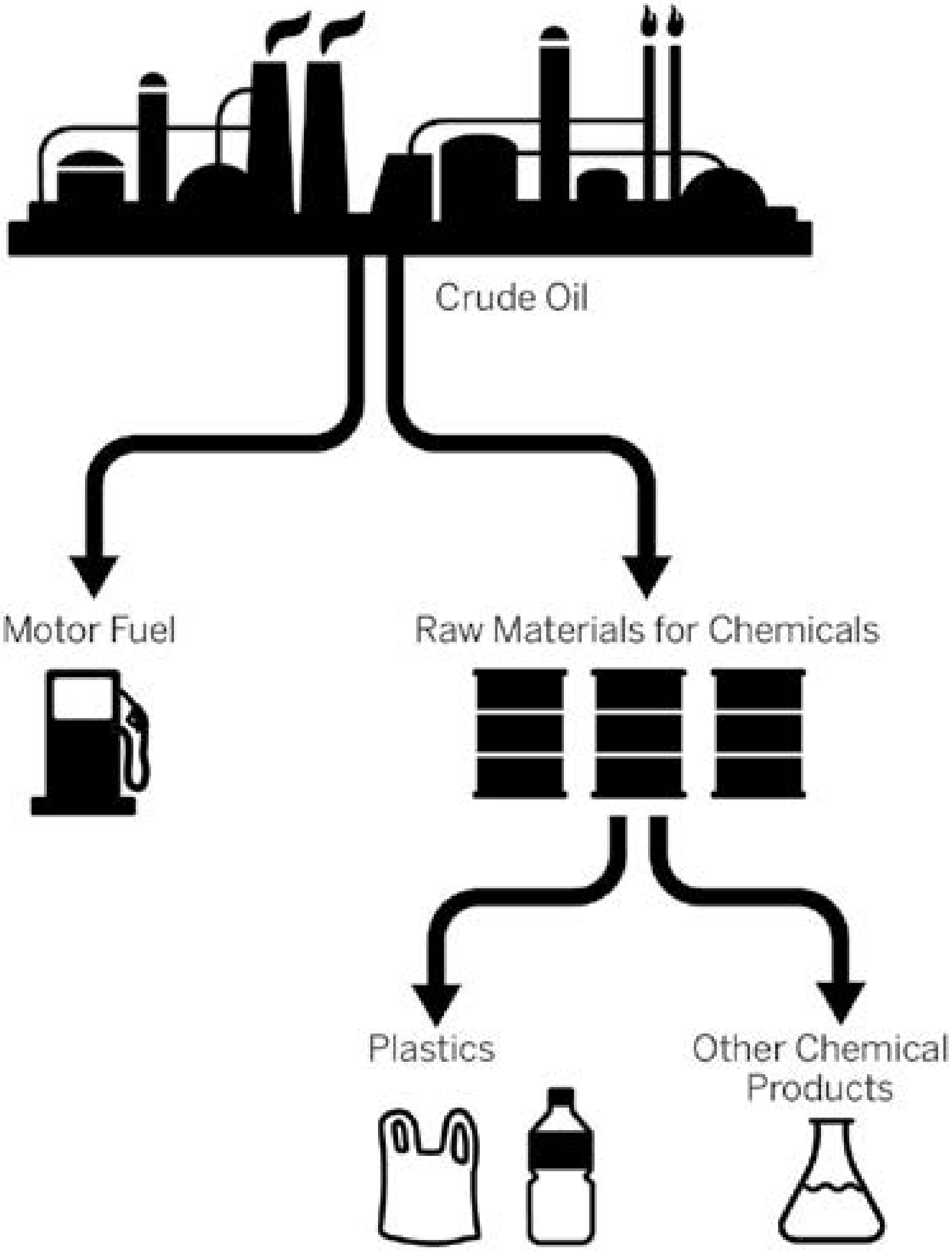




1. Marine plants and animals die and sink to the bottom of the seabed.
2. The plant and animal layer gets covered with mud.
3. Over time, more and more sediment creates pressure and turns the dead plants and animals into oil.
4. Oil is pushed up through rocks and forms a reservoir or big pool.

NAME: ______________________ DATE: ____________

From Crude Oil to Plastics



ACTIVITY PAGE 13.2

NAME: ______________________ DATE: ____________

Continue reading Chapter 13 up to "'Thanks, Achy-Breaky,' he said, 'I needed that.'" Answer the question below each paragraph:

"In photosynthesis, the atoms making up molecules of water and carbon dioxide are recombined, using energy from sunlight, to produce molecules of sugar and oxygen gas. Plants release the oxygen into the air, and use the sugar molecules to grow and build their bodies, including the parts that animals and people eat for food."

1. Three sets of chemical changes are mentioned. Can you describe them? *Hint: Two of them were described in the chemical changes game.*

____

____

____

____

"'Excellent question, Felix.' Tess took a deep breath and let it out slowly. 'The cells of all living things produce carbon dioxide as a waste product. We get rid of it by exhaling.' Then she gestured toward the fossils that lay in the rock beside them. 'Whenever something dies, like good old Achy-Breaky, the compounds in its body are broken down and the atoms that formed them are recycled. Some chemical changes that are part of decomposition return carbon to the air as carbon dioxide.'"

2. Why did Tess take a deep breath and let it out slowly?

____

____

3. Tess describes two ways carbon dioxide enters the air. Exhaling is one. What is the other?

____

____

ACTIVITY PAGE 13.2

NAME: ______________________ DATE: ____________

"'When this amazing dinosaur died, the compounds that made up his body were broken down by chemical changes. The atoms that were once part of those compounds moved on. Perhaps, thanks to chemical changes, some of Achy-Breaky's atoms are now part of compounds in the soil or the water or the air. Perhaps'—Tess paused and her voice fell to a whisper—'the air that you're breathing right now contains atoms that were once part of this dinosaur.'"

4. Tess said before this paragraph that it doesn't matter if we are breathing in the atoms of dead bodies. Why?

   ____

   ____

   ____

Now look at the chemical formula descriptions below.

The chemical formula for plant sugar is $C_6H_{12}O_6$, where C stands for carbon, H stands for hydrogen, and O stands for oxygen. The numbers tell you how many atoms of each element are in the compound.

Carbon dioxide has the formula CO_2.

Water has the formula H_2O.

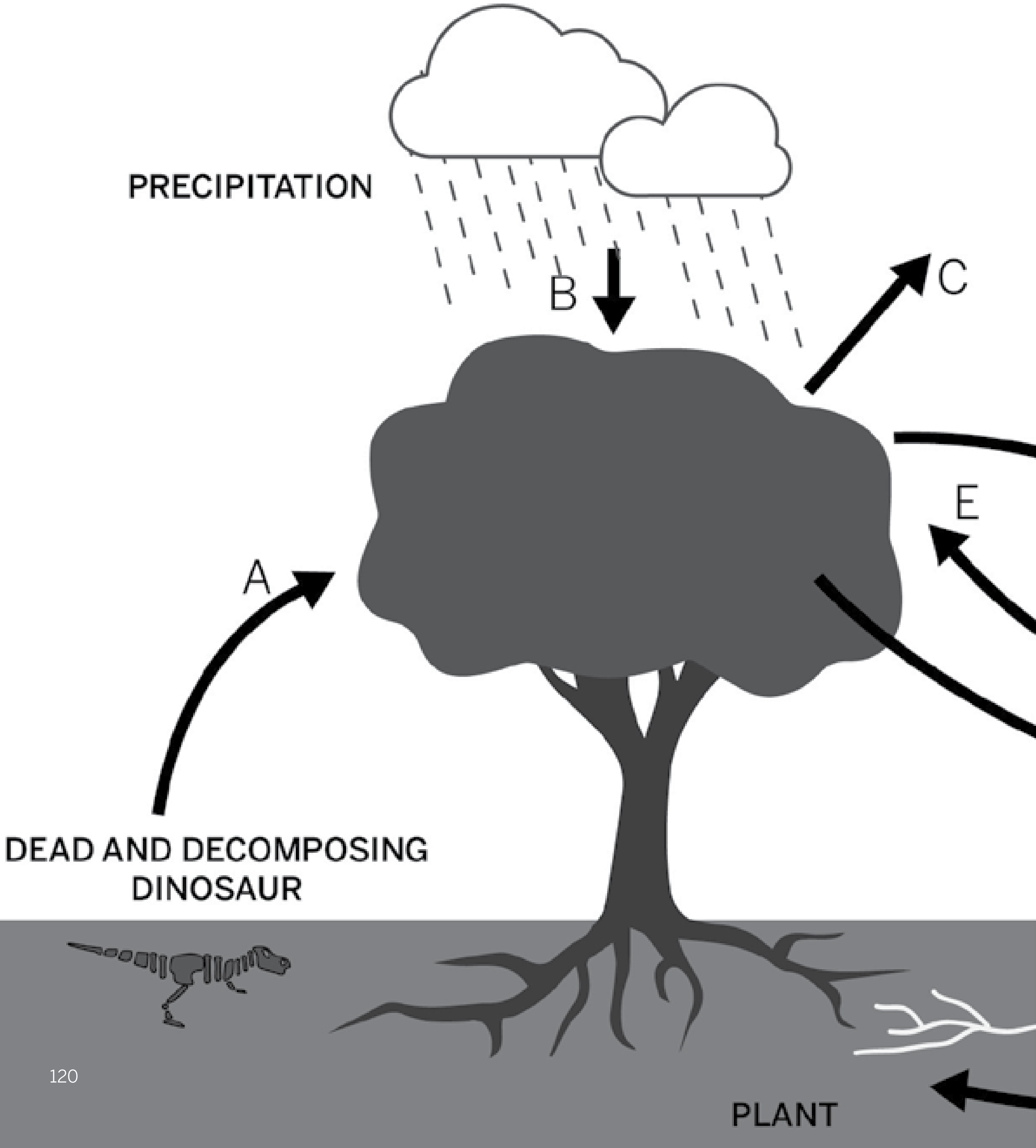
Oxygen has the formula O_2.

Using the chemical formula and the diagram on the next page:

1. Annotate the diagram by describing how chemical changes occur through photosynthesis and beyond.
2. Draw the appropriate chemical formula next to the appropriate parts of the diagram to explain how chemical matter is transformed through this process.

ACTIVITY PAGE 13.2

NAME: ______________________________ DATE: ______________



NAME: ______________________ DATE: ____________

A.

B.

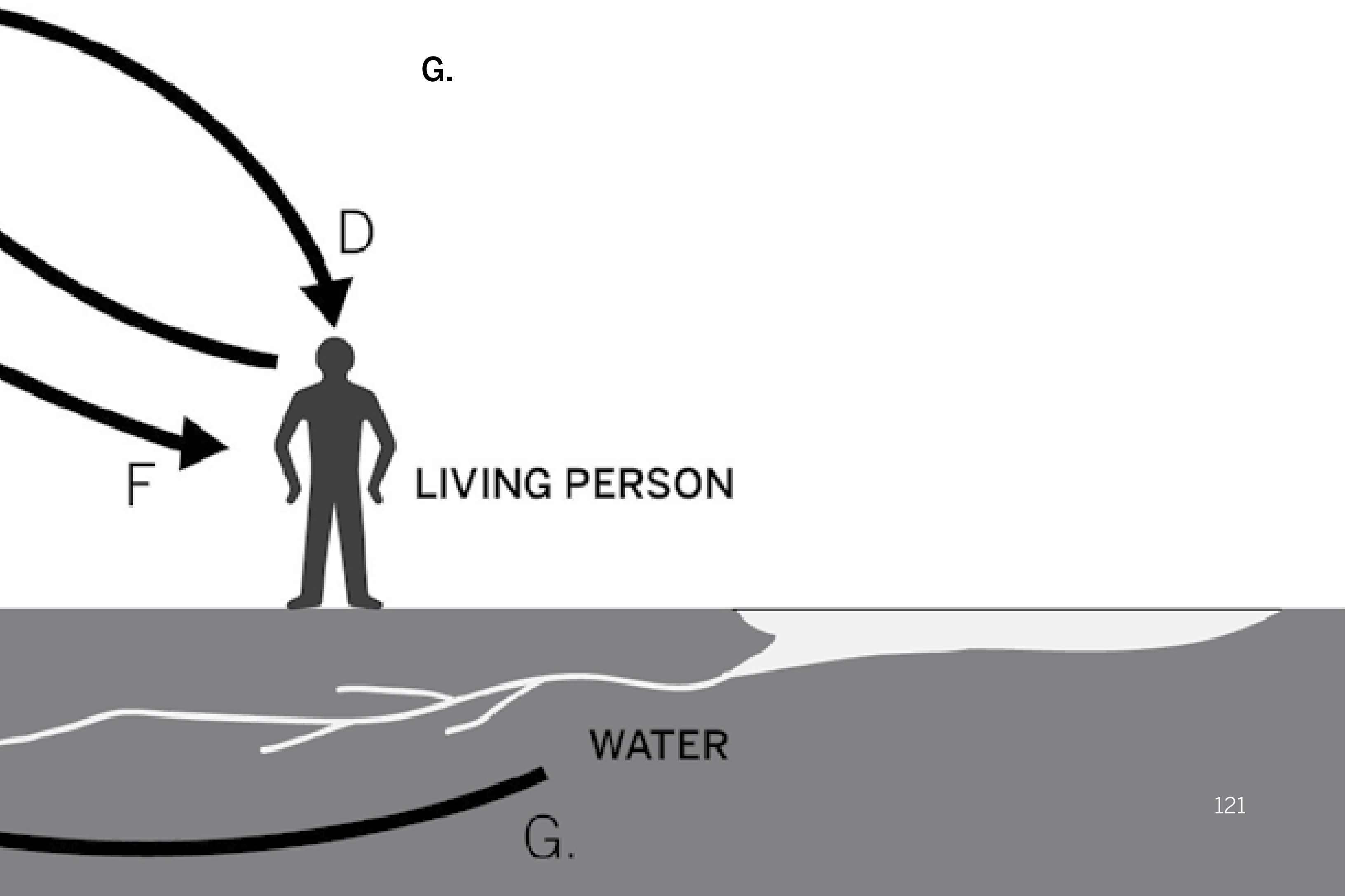
C.

D.

E.

F.

G.



ACTIVITY 13.3

NAME: ______________________ DATE: ______________

GRAMMAR

I. **Combine the pairs** below using the future perfect tense. The first has been completed for you.

Felix will eat cake (before he eats dinner).

"Felix will have eaten cake before he eats dinner."

Amy will go for a walk (before she goes to sleep).

We will do the washing up (before going to bed).

I will become a detective (before you become a paleontologist).

NAME: ______________________ DATE: ______________

2. **Use the present perfect tense** to create a sentence from the following descriptions:

   visiting France every year since you were a child

   ____

   ____

   growing five inches already this year

   ____

   ____

   waiting for a bus for 30 minutes

   ____

   ____

ACTIVITY 13.4

NAME: ______________________ DATE: ______________

RESOLUTIONS

As you read, complete the table below:

	Character's wants
Amy	
Dr. Forester	

ACTIVITY 13.4

NAME: ______________________ DATE: ______________

Character's behavior	Character's resolution

ACTIVITY 13.5

NAME: ______________________ DATE: ______________

Answer the question below.

Think about Amy or Dr. Forester. Do you think the Reader provided a satisfying resolution for her character? Explain your answer using evidence from the text.

____

____

____

____

NAME: ____________________ DATE: ____________

ACTIVITY 14.1

NAME: ______________________ DATE: ______________

Use the table below to create a first plan for your new detective story.

	Details
Setting	
Characters	
My character's "wants"	
How will my story begin?	
How will my story end?	
The plot (sequence of events)	(see diagram)
What scientific content might I use?	

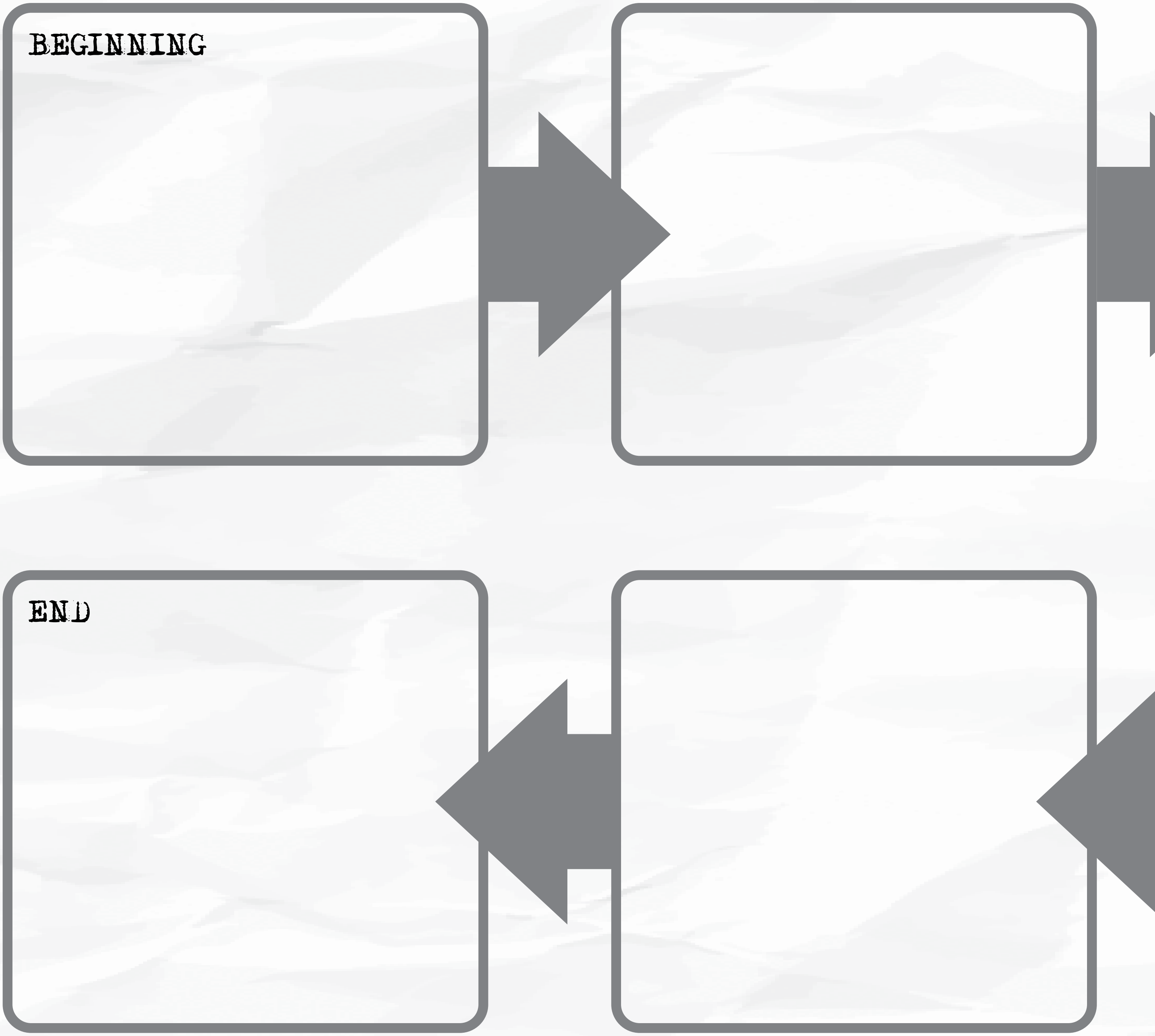
NAME: ______________________ DATE: ______________

Description words I plan to use

ACTIVITY 14.1

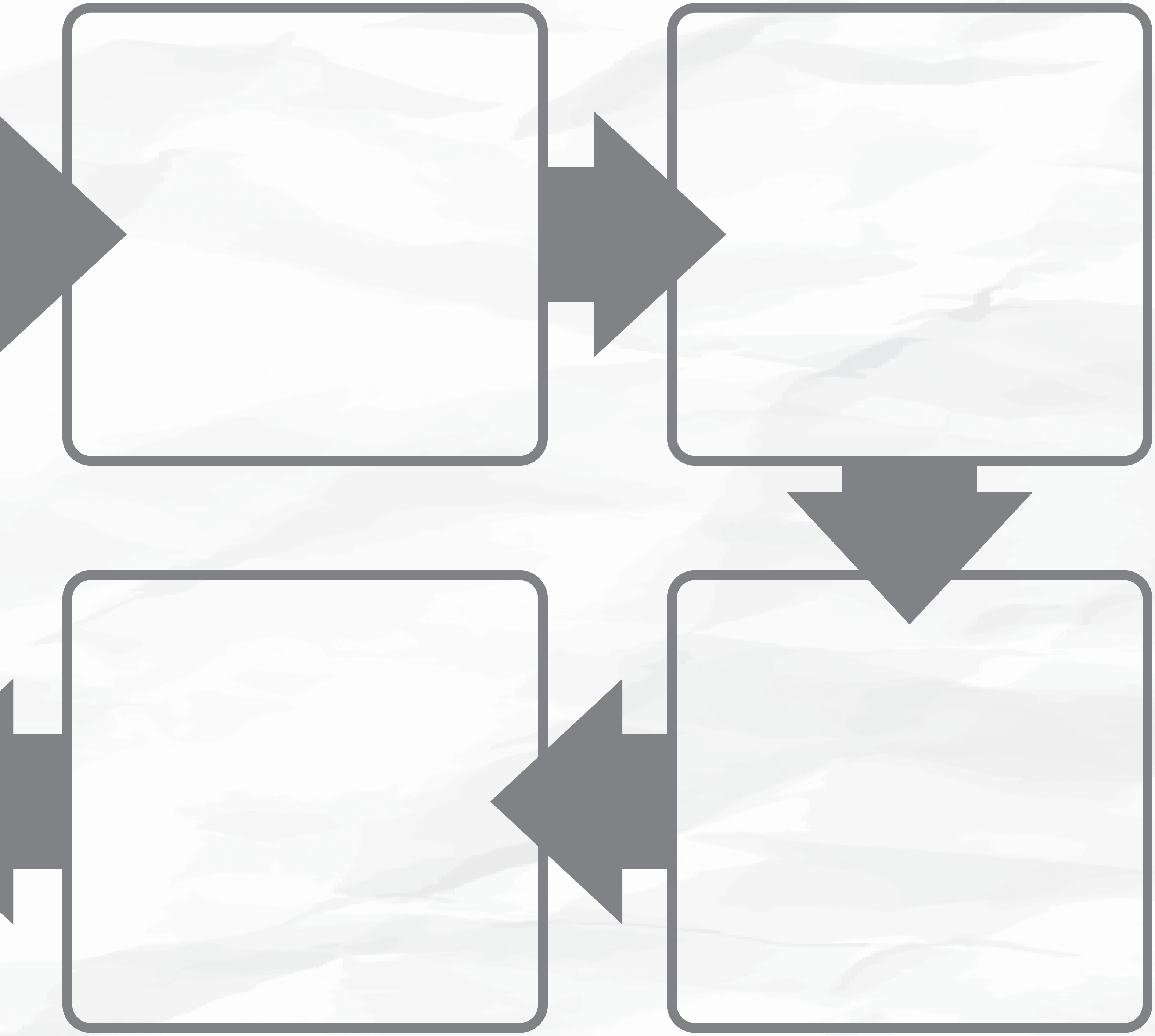
NAME: ______________________ DATE: ______________

You may also wish to use the following diagram to help you think about plot sequence.



ACTIVITY 14.1

NAME: ______________________ DATE: ______________



ACTIVITY 14.2

NAME: ______________________ DATE: ______________

STORY

In the space below, start drafting the first chapter of your detective story.

ACTIVITY 14.2

NAME: ______________________ DATE: ______________

ACTIVITY 14.2

NAME: ______________________ DATE: ______________

ACTIVITY 14.2

NAME: ______________________ DATE: ______________

ACTIVITY PAGE 15.1

NAME: ____________________ DATE: __________

Today you will read two pieces about chemical matter. After reading the excerpts, you will answer several questions based on the texts. Some of the questions have two parts. You should answer Part A of the question before you answer Part B.

The Ancient Art of Making Salt

1 Salt is a chemical compound known to chemists as sodium chloride. A molecule of sodium chloride contains one atom of the element sodium (chemical symbol Na) and one atom of the element chlorine (chemical symbol Cl) bonded together. If you look closely at ordinary table salt, the kind you find in saltshakers on restaurant tables, you'll see that this compound occurs as tiny, white, cube-shaped crystals.

2 Salt is surely one of the world's most common seasonings and has been for thousands of years. Since ancient times, people have cooked with salt, added it to breads and other baked goods, and sprinkled it directly on foods to improve their taste. Salt is so plentiful and inexpensive in the modern world that we hardly think twice when we grab a saltshaker and shake some of these tiny white crystals onto popcorn or corn on the cob.

3 But where does salt come from? In some parts of the world there are large deposits of salt deep underground, and salt is mined like other minerals such as silver or iron. Probably the oldest source of salt, however, is seawater. Seawater is a solution containing a number of dissolved substances, but salt (chemical symbol NaCl) makes up the greatest proportion of these dissolved substances. If you have ever gone swimming in the ocean and swallowed a little seawater, you know that it really does taste salty!

4 In ancient times, people who lived near the ocean obtained salt from seawater by letting the water evaporate and exploiting this physical change in the state of matter to separate out the salt. As the water in seawater evaporates, the salt

NAME: ______________________________ DATE: ______________

remains behind as tiny crystals. This traditional method of harvesting salt from the ocean continues today. The process begins when seawater is channeled into large, very shallow ponds with low walls around them so the water cannot run out or flow back into the ocean. Then the water is simply allowed to evaporate with the help of heat from the sun. Because the sun provides the heat to power the salt-making process, salt produced this way is sometimes called solar salt.

5 Depending on the temperature, the evaporation process may take many months or even years, ending only when all the water has changed state into water vapor, leaving behind flat beds covered with a thick layer of salt crystals. The salt crystals are raked into piles and put into bags or shoveled onto trucks that deliver the salt to factories where it is processed and packaged. Because solar salt production relies on evaporation, it is easy to understand why most salt ponds are in places that tend to be hot and dry, and have very little rain. Imagine how frustrating it would be to have a bed of solar salt almost dry enough to harvest, only to have a thunderstorm flood the pond with rainwater so that all the salt dissolves again!

6 Not all solar salt is produced from seawater, however. The Great Salt Lake in Utah is one of the saltiest bodies of water on the earth, much saltier than the ocean. It is salty because rivers flow into the lake, bringing water that contains dissolved salt, but no water flows out. As water evaporates from this enormous lake—the largest body of water between the Great Lakes and the Pacific Ocean—the salt becomes more and more concentrated. Depending on the time of year (and the amount of rainfall) the Great Salt Lake is typically three to five times saltier than the ocean. In fact, the Great Salt Lake is too salty for fish and most other types of living things that you would expect to find in a lake. About the only animals able to live in the Great Salt Lake are tiny brine shrimp, a favorite food of certain types of birds—and of fish kept in aquariums. If you've ever had fish as pets, you may have fed them dried brine shrimp harvested from the Great Salt Lake!

ACTIVITY PAGE 15.1

NAME: ______________________ DATE: ____________

7 Commercial solar salt-making around the Great Salt Lake began in 1847, although Native Americans living in the region probably made use of salt deposits that formed along the lakeshore long before that. Scientists estimate that there are nearly 5 billion tons of salt in the Great Salt Lake. Every year roughly 2.5 million tons of solar salt are extracted from the lake's salty waters, having been produced in commercial evaporation ponds. Salt from the Great Salt Lake is also rich in the elements potassium, magnesium, and sulfur.

NAME: ______________________________ DATE: ____________

The Atomic Ice Cream Shop

1 Alice pushed open the heavy door of the ice cream shop and flopped down in a chair at one of the small metal tables. Her friend Trevor was right behind her, but he stopped for a moment to glance up at the big chalkboard that listed the day's ice cream flavors in several columns.

2 "Mmmm, they have chocolate peanut butter swirl today," he said, slipping into a chair across from Alice. "That's one of my absolute favorites."

3 "Oh, Trevor, I have so much homework to do," Alice lamented. "And I didn't really get what Mr. Matobi talked about in science today, all that stuff about atoms and elements and molecules and compounds. I can't keep those terms straight in my head."

4 "Well, maybe I can help." Trevor sat up straight and cleared his throat. "All matter is made up of small particles called atoms. There are more than a hundred different kinds of atoms and each kind is called an element. The elements are all listed on the periodic table of the elements that we have hanging on the wall in science class. Now atoms of various elements can combine—"

5 "Wait, wait, wait!" said Alice. "You're confusing me even more. Let's start at the beginning: what's the difference between an atom and an element?"

6 Trevor took a deep breath and said in a slow, even voice, "An element is a building block of matter that can't be simplified, while an atom is the smallest amount of an element you can have."

7 Alice looked cross-eyed at her friend. "I'm never going to get this, Trevor. You've got to make it simpler somehow!"

NAME: ______________________________ DATE: ______________

8 "Hmmm," Trevor said, glancing around the ice cream shop. His gaze fell on the chalkboard again, with all the many flavors of ice cream written in colored chalk. "I've got an idea. Let's say that the chalkboard up there is like the periodic table of the elements. Each ice cream flavor that's listed is like an element, a building block that we can use to create a fantastic dessert. Okay so far?"

9 Alice stared up at the board and nodded. "Got it. Each flavor of ice cream is an element."

10 "Now, the smallest portion of ice cream you can buy here is one scoop," Trevor continued. "So let's say that one scoop of ice cream is like an atom. An atom is the smallest amount of an element you can have that still has that element's properties."

11 "Okay, one scoop equals an atom," Alice repeated.

12 "Now, suppose I decided to get two scoops of chocolate peanut butter swirl. The girl behind the counter would put those two scoops in a waffle cone and kind of mash them together so they would stay put. Those two scoops are like two atoms of the same element—in this case, chocolate peanut butter swirl—bonded together to form a molecule."

13 "Oh, yes, that makes sense," said Alice. "Atoms bonded together form molecules."

14 "Now, suppose you ordered one scoop of raspberry cheesecake and one scoop of French vanilla. When the girl behind the counter puts those two different flavors of ice cream together in a cone, you've got a molecule made up of atoms of two different elements, which is—"

15 "—a compound!" Alice finished triumphantly. "Trevor, I think I've got it. So let me repeat that back to you, but without the ice cream analogy."

NAME: ______________________________ DATE: ____________

16 “Shoot,” said Trevor, sitting back in his chair.

17 “An element is a basic substance that is one of the building blocks of matter,” Alice said evenly. “The periodic table lists all the elements. An atom is the smallest amount of an element you can have that still has the properties of that element. A molecule is two—”

18 “—or more,” Trevor interrupted. “We could get three scoops, or four, or . . .”

19 Alice put up her hand. “A molecule is two or more atoms bonded together. And a compound is a molecule that contains more than one kind of element!”

20 “Outstanding!” her friend said with a smile. “Now let’s eat.”

21 “Thanks, Trevor,” Alice said, getting out her purse. “And to show you how much I appreciate your help, I’m going to buy your ice cream cone. What’ll you have?”

22 Trevor’s eyes lit up. “I’ll have a compound made up of the elements chocolate peanut butter, caramel swirl, and rocky road.”

23 Alice laughed. “With those flavors, it’ll be a molecule that’s definitely a new kind of matter!”

ACTIVITY PAGE 15.1

NAME: ______________________________ DATE: ______________

1. The word *evaporate* appears several times in the first excerpt. What is the meaning of the word *evaporate*?

   A. to turn from a solid to a liquid

   B. to turn from a liquid to a gas

   C. to turn from a gas to a liquid

   D. to turn from a liquid to a solid

2. Can you provide a detail from paragraph 5 that helps the reader determine the meaning of the word *evaporate*?

   ____

   ____

   ____

3. From the first excerpt, list three ways in which salt is produced. Give the paragraph number where the method is first introduced.

   ____

   ____

   ____

   ____

NAME: ______________________________ DATE: ______________

4. "Because solar salt production relies on evaporation, it is easy to understand why most salt ponds are located in places that tend to be hot and dry, and have very little rain." Explain why this is easy to understand.

____

____

____

5. We are told that Alice "lamented." From the context, what do you think *lamented* means?

   A. to express sorrow

   B. to express happiness

   C. to express tiredness

   D. to express laziness

   Give a reason from the text for your answer.

____

____

6. In the last paragraph of the second excerpt we are told Trevor's eyes "lit up." Is that a literal description? If not, what is it?

____

____

____

ACTIVITY PAGE 15.1

NAME: ______________________ DATE: __________

7. What inference can we make about Alice's feelings about science from the second excerpt?

   A. She hates it.

   B. She is confused by it.

   C. It is her favorite subject.

   D. It is okay but she prefers ice cream.

   Provide evidence from the text, citing the paragraph number or providing quotes, for your answer below.

   ____

   ____

   ____

8. One of these excerpts is informational, and the other is literary. Can you identify which is which? Provide reasons for your answer.

   ____

   ____

   ____

9. For the literary text, can you name some informational elements in that text?

   ____

   ____

   ____

NAME: ______________________ DATE: __________

10. In the table below, describe how Trevor uses ice cream as an analogy for atoms and compounds.

Concept	**How it links to ice cream**
periodic table of elements	*chalkboard showing ice cream flavors*

NAME: ______________________________ DATE: ______________

11. Read both excerpts. Can you use the information on elements and compounds in the second excerpt along with information from the first excerpt to explain why salt is a compound? Reference the text from the excerpts you are using.

____

____

____

____

12. Read both excerpts. Can you explain, using examples from both excerpts, the differences between an element, a compound, and a solution?

____

____

____

____

____

NAME: ______________________________ DATE: ______________

13. Reread paragraphs 4 and 5 of the first excerpt. In the space below, write a narrative literary text that conveys the content in these paragraphs. Complete the table underneath your narrative to explain what you have done.

ACTIVITY PAGE 15.1

NAME: ______________________________ **DATE:** ______________

The facts I have conveyed	1. 2. 3.
My literary characteristic 1	
My literary characteristic 2	
My literary characteristic 3	

NAME: ______________________________ DATE: ______________

Grammar

1. Expand each sentence below using descriptive details, including adjectives and adverbs. You may replace words if you maintain the same meaning.
   - Amy solved the case.
   - I listened to Trevor's explanation.
   - She walked into the ice cream parlor.

____

____

____

____

2. Combine each pair of sentences below and underline the linking word you have used.
   - I went into the ice cream parlor. The owner smiled at me.
   - I went into the ice cream parlor. I was hungry.
   - I went into the ice cream parlor. I walked right out again.

____

____

____

____

____

ACTIVITY PAGE 15.1

NAME: ______________________________ DATE: ______________

3. Reduce each of the following sentences to be as concise as possible.

   - The ice cream, soft and tingly on the tongue, made me sigh with pleasure as I devoured it.
   - Salt, which is a fascinating compound, can be extracted in many ways, some of them from ancient times, while some are more modern.

   ____

   ____

   ____

   ____

4. Circle the subject of each sentence below and then insert a comma after the introductory element.

   A. To be first in line Alice had to queue outside the parlor for a long time.

   B. Realizing she was annoyed Trevor let Alice finish her sentence.

   C. Putting her hand in her pocket Alice said, "I'll buy this."

5. Insert a comma into each of the sentences below in the relevant place and circle it.

   A. You think I'm talking too much don't you?

   B. Yes I suppose I do.

   C. It wouldn't help if I taped my mouth shut would it?

   D. No I don't think that's a good idea.

NAME: ______________________________ DATE: ______________

6. Use the events below to construct sentences in the past perfect tense.

   Event 1: going to the ice cream parlor; Event 2: learning about chemistry

   ____

   ____

   Event 1: evaporating seawater; Event 2: extracting salt

   ____

   ____

Morphology

7. Write the correct word to complete each sentence, adding the suffix –*ment*.

   A. Solving the case was a great ____________________________.
   (amaze, achieve, align, excite)

   B. People had different views on the culprit. It caused

   great ____________________________.
   (agree, disagree, judge, enforce)

ACTIVITY PAGE 15.1

NAME: ______________________________ DATE: ______________

8. Write the correct word to complete each sentence:

   A. "I applied three times before I was given ____________________ to
   (admission, permission, remission, emission)
   join the fossil dig."

   B. "I ____________________ that I didn't understand what she was
   (admitted, emitted, transmitted, permitted)
   talking about."

   C. "Your ____________________, should you choose to accept it, is . . ."
   (mission, missile, admission, transmission)

NAME: ______________________ DATE: ______________

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TEXAS
ELEMENTARY LITERACY PROGRAM

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ENGLISH

Grade 5

Unit 8 | Reader

The Badlands Sleuth: The Case of the Missing Fossils

Grade 5 | Unit 8

The Badlands Sleuth:

The Case of the Missing Fossils

Reader

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Contents

The Badlands Sleuth: The Case of the Missing Fossils

Reader

Chapter 1

Welcome to Fossil Camp!

THE BIG QUESTION
What is the "stuff" that makes up the universe?

"It's got to be over a hundred degrees out there," Amy **muttered**, staring through the windshield of the pickup. The badlands of eastern Montana **shimmered** in the heat under a pale, cloudless sky. **Barren** ridges of weathered rock towered above dry gullies and patches of stiff prairie grass. Amy aimed the air conditioner vent so it blew directly on her face. "I really don't like being hot."

"I'm afraid it's even hotter out at the fossil site," said Tess, swerving to avoid a pothole in the narrow dirt track. "Lately it's been over ninety degrees in the shade."

'*Great!*' thought Amy. She fanned herself with a paperback book. It was her favorite kind of book: a mystery featuring a clever detective. She had read most of it on the flight from Chicago and then finished it while she and Matt waited for Tess to pick them up at the small airport in Billings, Montana.

Amy glanced back at her twin brother. He was **sandwiched** between their two backpacks in the back seat, with a big grin on his freckled face. Last month, when Matt had learned about Fossil Camp, he'd burst into her room, waving the camp brochure. "We can actually dig for dinosaur fossils," he'd whooped. Amy had planned to spend her summer vacation at home, reading mysteries out on the breezy screened porch and drinking tall glasses of icy lemonade. But Matt had talked their parents into Fossil Camp—and Amy into coming with him. Now, sweltering in the heat, she was having second thoughts.

"What's Dr. Forester like?" Amy asked. She'd read in the brochure that Dr. Pam Forester was the paleontologist in charge of Fossil Camp.

“She’s amazing,” Tess replied, “and a world expert on Cretaceous dinosaurs.”

“Like *Tyrannosaurus*?” Matt asked.

“Like *Tyrannosaurus*,” Tess said, smiling at him in the rearview mirror.

“I hope we make an important **discovery**,” Matt said, digging his water bottle out of his pack.

“Anything’s possible,” Tess said. “These dry badlands are among the best places in North America to look for fossils, especially dinosaur bones.” She swerved again but failed to avoid a deep rut, and the pickup **lurched** hard to one side. “Sorry about the bumps,” she said, “but the road washes out a little bit more every time it rains.”

“Who are the other campers?” Amy asked.

“There are two other girls and two other boys,” Tess replied. “Daria and Julian are your age. Felix and Kristal just finished sixth grade, so they’re a year ahead of you in school.”

Amy hoped the other kids would be nice, because together with Dr. Forester and Tess, they were all going to be camped out in this desolate landscape for ten days. She glanced back at her brother again. Matt made new friends easily and he also didn’t mind heat. Or dirt. Or bugs. Or... Amy sat up suddenly as a new thought occurred to her. “Are there snakes out here?”

Tess nodded but kept her eyes on the track. “Plenty. But we rarely see them during the day because it’s so hot and they stay curled up in holes or under rock ledges.”

‘*Double great!*’ Amy thought, swallowing hard. Snakes made her sweat as much as hot weather. And what did Tess mean about not seeing snakes “during the day”? Did they come out at night? She was about to ask when they crested a low rise and Tess suddenly pointed.

“There’s our camp!”

A cluster of tents stood in the shadow of a high, barren ridge. A slender woman with a deep tan waved as they pulled in. When they stopped, she strode over to the pickup, followed by four kids.

“Welcome to Fossil Camp, Amy and Matt! I’m Dr. Forester, and these are your fellow campers.” She quickly made the introductions. Felix was tall and very thin, with bony knees and elbows. Julian was about Matt’s height, with close-cropped hair and a friendly grin. Daria was average height with short, dark hair and watchful eyes that seemed to take in everything at a glance. Kristal was taller than Daria. Her blonde hair was swept to one side in a ponytail, and she wore big dark glasses.

“Why don’t you all help Amy and Matt get settled?” Dr. Forester suggested. “Then we’ll have orientation in our field laboratory. That’s the big canvas tent with the awning out front.”

A wave of hot, dry air hit Amy as she stepped into the tent she was going to share with Kristal and Daria. “It’s unbearable in here,” she choked. “How are we supposed to sleep?”

“Dr. Forester says it gets a lot cooler at night,” Daria said.

There were three cots inside, each with a sleeping bag and pillow. Kristal took off her sunglasses and used them to point at the cots, one by one. “I’m here and Daria’s there, which leaves you in the bed by the door. Sorry.”

Amy thought sleeping close to the tent flap might be the coolest spot at night, so she didn’t mind not having a choice. She dropped her backpack onto her cot.

“Did you bring your phone?” Daria asked.

Amy nodded. “But I haven’t gotten a signal since we left Billings.”

Daria sighed and looked disappointed. “I thought maybe it was just my phone. I’ve never been anywhere I couldn’t make a call. It’s like being in the middle of nowhere.”

“We *are* in the middle of nowhere,” Kristal said. She reached under her pillow, grabbed what looked like a large sketchbook, and stuffed it under her arm. “Come on, I don’t want to miss anything.”

“Cool camp, huh?” Matt whispered to Amy as they joined the others in the lab. “This is going to be so much fun!”

Hoping her brother was right, Amy tried to put the heat and the possibility of snakes out of her mind as everyone gathered around Dr. Forester. She was standing next to a long table on which there were boxes, some instruments that Amy recognized from science class, and six, small, cloth bags.

“Over the next ten days you’re going to get firsthand experience excavating fossils,” Dr. Forester began. “You’ll also learn about other things that paleontologists do.”

Felix raised a lanky hand. “Um, when do we eat?”

“Breakfast is at six o’clock and we’ll leave for the fossil dig site at seven o’clock, along with a packed lunch and a cooler full of cold drinks. We’ll return to camp around five, have dinner at six, and then you’ll have some time to relax around the campfire before bed.”

Felix raised his hand again. “And what about snacks?”

Dr. Forester suppressed a smile. “Don’t worry, Felix, there will be plenty of food.” Then she **gestured** toward Tess. “And now Tess has something to show you I think you’ll find pretty interesting. She’s is one of my students, by the way, and is getting her degree in **paleontology**, with a minor in **chemistry**.”

“Chemistry?” Julian raised an eyebrow. “What’s chemistry got to do with fossils?”

“Actually, quite a lot,” Tess replied. “Chemistry is the reason we have fossils out there to hunt for and collect.” She reached into the pocket of her jeans and drew out something dark and curved that she held up for them all to see. “Fossils like this.”

“Wow, a raptor claw!” Matt gasped.

“This claw belongs to *Velociraptor,* the type of dinosaur that certain movies made so famous,” Tess explained. “The dinosaur whose fossil bones you will be excavating was closely related to Velociraptor, so there’s a chance we might unearth a claw similar to this one.” Tess handed the fossil claw to Daria and asked her to pass it around.

When Amy took the claw from Daria, she was surprised at how heavy it was. “What is a fossil, exactly?”

“You’ll learn a lot about fossils and how they form while you’re here at camp,” Tess replied. “But for now, think of a fossil as **matter** that’s undergone a change.”

“Matter?” Julian asked, frowning.

“Matter is everything in and around you,” Tess explained, “all the ‘stuff’ on the earth, in our solar system, our galaxy, and the rest of the universe.”

“You mean the solid stuff, right?” Julian’s frown had deepened.

“Not just the solids. Matter exists in different forms, or states. Most matter on the earth exists as a solid, a liquid, or a gas. For instance, that fossil claw is matter in a solid state, water is matter in a liquid state, and the air we’re breathing is matter in a gaseous state.”

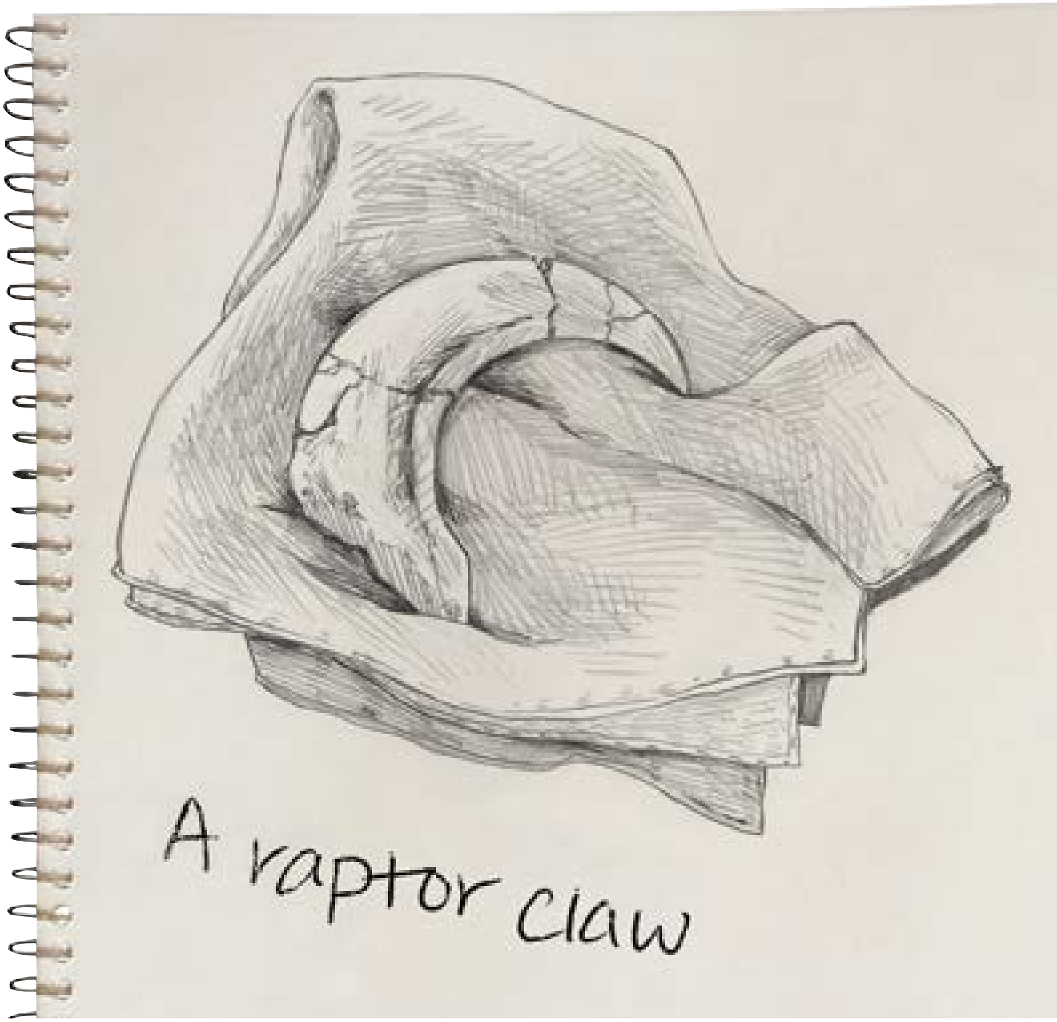
Tess took back the claw from Felix. “Most of the fossil bones we’ll be excavating, Dr. Forester and I will study back in our lab at the university. Some of the smaller ones, though, we’ll analyze right here. Part of analyzing fossils involves recording information about each one.”

“What kind of information?” Kristal asked, quietly flipping open the book she’d brought along. Amy saw that its pages were filled with drawings and realized it was indeed a sketchbook.

“We typically start by recording a fossil’s physical properties. We can use our senses to describe the physical properties of a given type of matter. For instance, how would you describe this fossil claw?”

Kristal began sketching the fossil in Tess’s hand. “It’s has a smooth, curved surface,” she said softly.

“Very good!” Tess said smiling. “Shape and texture—the roughness or smoothness of something—are physical properties of matter. Some fossils we find might be smooth like this claw, while others may be rough or pitted or have interesting marks on them.”



“Marks?” Daria looked puzzled.

“Grooves, dents, or possibly bite marks made by predators.”

“Awesome,” Matt murmured.

“If color is a physical property, then we could record that the claw is really dark brown,” Julian suggested.

Tess nodded. “Basically anything you can see, touch, taste, or smell is a physical property of matter.”

“You really want us to taste and smell the fossils?” Felix asked, wide-eyed.

Tess burst out laughing. “That won’t be necessary, Felix. But keep in mind that people see colors and describe textures differently. A fossil that looks dark brown to Julian might look different to someone else. Mass on the other hand,” she continued, “is a physical property of matter that can be measured. Mass is the amount of matter in a substance or object. In fact, a formal definition of matter is anything that has mass and takes up space.”

Tess stepped over to the table. “Mass is typically measured in metric units such as grams. We use a balance to measure the mass of small fossils such as this fossil claw.” She placed the claw on the flat pan of the balance and slid the weight along its arm. “As you can see, the claw has a mass of 113.4 grams. If you don’t know how to use a balance, I can show you later tonight.”

“That’s because right now,” Dr. Forester said, gathering up the cloth bags and handing them out, “we are going to head out to the dig site. These bags contain tools that paleontologists use to excavate fossils. So grab your hats and let’s go meet our dinosaur!”

Matt **nudged** Amy, and she saw the glow of excitement in his eyes. Amy wanted to feel excited too, but she wished she hadn’t let Matt talk her into coming to Fossil Camp. She wished she was back home in Chicago instead of being stuck out here in such a hot place—a hot place with snakes.

Chapter 2

A Bed of Bones

THE BIG QUESTION
How can water, ice, and vapor be the same thing?

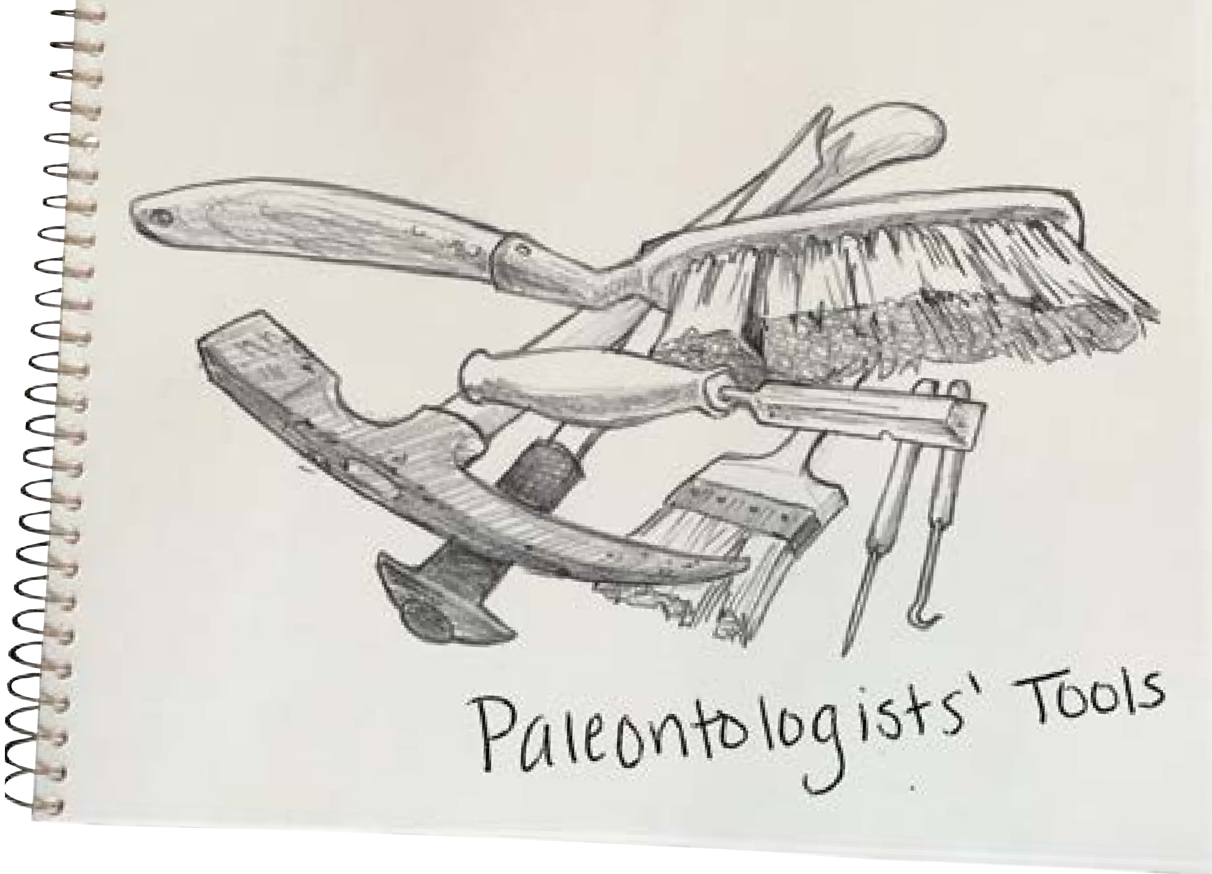
"Meet *Acheroraptor temertyorum*," Dr. Forester said, gesturing down at the dark fossils **embedded** in the pale rock at their feet. "He lived in this part of North America about 66 million years ago, along with other dinosaurs such as *Tyrannosaurus* and *Triceratops*. Tess and I call him Achy-Breaky for short: Achy for the first part of his scientific name, *Acheroraptor*, and Breaky because some of his fossil bones are broken up into pieces."

'No kidding!' thought Amy. She had expected the dinosaur skeleton to be nicely laid out like those she'd seen in museums. Instead, different fossil bones were angled this way and that, like a jumble of large and small puzzle pieces. She edged further into the square of shade cast by the blue plastic tarp that had been strung over the dig site. It was situated on a narrow **plateau** about halfway up a rocky ridge, completely **exposed** to the **blazing** afternoon sun.

Julian pulled out a rock hammer and a small chisel from his cloth bag. "So, do we use these to chip the fossils out of the rock?"

Dr. Forester shook her head. "Paleontologists use a hammer and chisel to break apart big chunks of rock or in places where there's no chance of damaging fossil bones. Once fossils are partially exposed, like they are here, we switch to smaller tools designed for more delicate work." She held up a slim metal pick and a small paintbrush. "In your tool bags, you'll find a pick like this for scraping away rock and a brush to whisk the rock dust away."

"Dr. Forester and I will demonstrate how to use these tools correctly on this leg bone we're working on," Tess explained, kneeling beside a long, narrow fossil. "Please listen and watch closely." She and Dr. Forester used their picks to scrape and scratch at the rock where it met the fossil.



“This rock is a type of sandstone and quite soft and crumbly. Excavating fossils like this is time-consuming, but not particularly difficult. It just takes patience,” Dr. Forester said. She used her brush to gently clean the area where she’d been working. “Every few minutes, use your brush like this to clear away the rock dust so you can see what you’re doing,” she added.

Amy and the other campers watched intently for a few minutes. Then it was their turn.

“Working with a partner,” Dr. Forester instructed, “Tess and I want you to choose a bone that you’d like to excavate together. Tess and I will work with you to make sure you’re getting the hang of it.”

Amy followed Matt, who made a beeline for the dinosaur’s jawbone at the far edge of the dig site. Julian and Kristal chose bones that Dr. Forester said were part of a foot, while Felix and Daria settled on a short chain of bones that were unmistakably part of the dinosaur’s backbone.

Matt began using his pick to very carefully scrape away the rock around one of the teeth that were embedded in the jawbone. “These teeth still look sharp!” he exclaimed.

Amy ran a finger around the bony edge at the back of the jawbone. It seemed as good a place to start as any, so she got out her tools and set to work.

Dr. Forester and Tess came around every so often and checked how everyone was doing. When they were confident that all the campers had the **technique** down, they worked together on the leg bone. For more than two hours, the only sounds were the scratch of picks and the swish of brushes, the buzz of flies, and the wind sighing through the dry grasses that grew along the edge of the plateau.

Julian broke the silence by asking what Amy thought was a strange question. “Dr. Forester, if I wanted to be a famous paleontologist, what would I need to do?”

She considered the question for a minute. “Well, finding a new type, or species, of dinosaur might make you famous—at least among other paleontologists. But there’s a lot of luck involved in fossil discoveries, Julian, and really important discoveries are few and far between. I’m afraid you can’t just set out to become famous and expect it to happen.”

Julian frowned. “My dad’s famous. He owns four restaurants in Dallas. And my brother is famous, too, because he plays football for a big university team. If we discover something new, I sure hope I’m the one to find it.”

Dr. Forester didn’t seem to know what to say. But Felix had perked up at the mention of restaurants. “Speaking of food,” he said, “is there anything to eat? Excavating fossils is hungry work.”

“Let’s take a break,” Tess offered, and led them to the far end of the plateau where the ridge formed a wall high enough to create a patch of shade. Everyone sat with their backs against the rock wall and stretched their legs out in front of them as Tess passed out bottles of water and energy bars from the cooler. Felix **devoured** one bar and started on another before anyone else had taken a bite. Amy wondered if he was always so hungry.

Munching slowly, Daria pulled out her phone and then frowned down at the screen. "No signal here, either."

"The cell coverage is pretty spotty," Dr. Forester explained, "so I'm afraid cell phones are fairly useless out here."

"It's no big deal," Daria said quickly. "I just miss my mom—I mean, I was just wondering what my friends are doing right now, that's all." She slipped her phone back into her pocket.

Julian helped himself to another bottle of water from the cooler. "The ice is melting fast in this heat."

"A good example of chemistry in action," Tess said.

"Chemistry?" Felix mumbled, swallowing the last bite of his third energy bar. "What does melting ice have to do with chemistry?"

"Remember that chemistry is the study of matter and how it changes," Tess said. "Solid ice melting to liquid water is an example of a physical change in matter in which matter changes from one state to another. Ice is water in its solid state. When ice melts, water undergoes a physical change, going from a solid state to a liquid state." Tess gestured toward the ice chest. "Suppose we poured that water out on the ground here. What do you think would happen to it?"

Kristal raised her hand hesitantly. "The water would gradually dry up and disappear, like rain on the pavement does when the sun comes out."

"Well, it might seem like it is disappearing," Tess replied. "But matter can't be created or destroyed. The water would slowly change states again, this time changing from a liquid to an invisible gas called water vapor that floats up into the air."

"You mean it **evaporates,**" Amy offered.

"Yes, that's the term," Tess replied. "A similar change in state from liquid to gas takes place when water boils."

“So if ice, water, and water vapor are all the same kind of matter, what explains the different states?” Matt asked.

“Excellent question, Matt,” Tess replied. “All matter is made up of small particles, so small that they can’t be seen with the naked eye. Whether a type of matter is in a solid, liquid, or gaseous state depends on how tightly packed these particles are, and how much energy they have. In a solid, such as an ice cube, the particles are crammed together. They can wiggle, but they don’t have enough energy to do much more than that. A solid keeps its shape because its particles are in such fixed positions.”

Tess took a sip of water from her bottle. “Matter in liquid form, like the water in this bottle, has particles that are farther apart than those in a solid. They have more energy, too, enough so they move freely, and slip and slide past each other. That’s why liquids flow. Matter in a liquid state doesn’t have a fixed shape. It takes the shape of whatever space it occupies.” She held up her bottle and tipped it from side to side.

“Matter in gaseous form,” Tess continued, “is made up of particles that are farther apart than those in a liquid and much farther apart than particles in a solid. And they have more energy, too. There is so much space between gas particles that they move very freely and rapidly in different directions. A gas spreads out to fill whatever space is available.” Tess spread her arms wide. “And here in Montana, we have lots of space!”

Julian scooped up a handful of the cold water in the bottom of the cooler and splashed it onto his face. “So my question is, how do we get more ice? I’m not too keen on drinking warm water.”

“Fortunately, physical changes in matter are reversible,” Dr. Forester chimed in. “Matter changes state when heat is added or taken away. For example, ice melts as it gets warm. Chill that water down by removing heat, and it turns back into ice. That’s what our **portable**, battery-powered refrigerator back at camp can do. It keeps our food cold and even makes ice.” She glanced at her watch. “How about we work for another half hour or so, and then head back to camp for dinner?”

“Dinner! Yes!” Felix cried, pumping his fist in the air.

“But you just ate three energy bars,” Daria said, looking amazed.

“That was nothing,” Felix replied, “because in a half hour I’ll most certainly be starving again. My mom says I burn calories really fast because I never sit still.” He leaped up and started doing a little dance along the edge of the plateau.

It seemed to Amy that what happened next unfolded in slow motion. Just as Dr. Forester called out for Felix to be careful, part of the rock ledge where he was dancing gave way. Felix swayed, trying to keep his balance. His eyes grew wide and, in the next instant, he was gone.

Everyone scrambled to the edge and looked down. Felix was sitting at the bottom of the gully about ten feet below, with a surprised expression on his face.

Dr. Forester’s face was dark with worry. “Felix, are you all right?”

Felix jumped to his feet and started dusting himself off. “I’m fine,” he called up, grinning. “I didn’t really fall; I just scooted down on my backside.” He started to climb the slope, but paused to pick something up from the gravelly bottom of the gully.

“What do you make of this, Dr. Forester?” he asked when he was back on the plateau. He held up what looked to Amy like a dark, oblong rock.

Dr. Forester gripped him by the shoulders. “Never do anything like that again,” she said sternly. “You could have been hurt.” Then she looked carefully at Felix’s find. “It’s definitely a piece of fossil bone,” she said slowly, turning it over and over in her hands. She nodded toward the gully. “I think I’ll hike down there and have a quick look around.”

Fifteen minutes later she was back with several more small fossil **fragments**. Everyone gathered around as she laid them out on the ground.

“What kind of animal are they from?” Kristal asked, pulling out her sketchbook and beginning to make drawings of the bones.

Dr. Forester shook her head. “I won’t really know until I’ve looked at them more closely. Let’s pack up our gear and head back.”

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Back at camp, Amy and Julian helped Tess make spaghetti in the tent that served as a kitchen. When dinner was ready, everyone gathered around a table set up outside. Tess went to the lab to get Dr. Forester, but she came back alone. “Dr. Forester says she’ll eat later after she’s done studying those little bones.”

The sun set while they were eating and a cool breeze sprang up. When they had finished dinner, Kristal and Matt did the dishes, and Tess built a huge campfire with thick chunks of wood. Everyone gathered around the fire, and Amy was surprised how good the heat from the flames felt as the temperature kept dropping.

Suddenly the fire popped and sparks shot up into the air.

“Whoa!” Daria said, scooting back a few feet. “I think a log just exploded!”

“It did, because water changed states,” Tess said quietly.

“What? Chemistry again?” Felix teased.

Tess just smiled. “Logs often have small pockets of water and sap in them. As the logs start to burn, the liquid gets hot enough to boil and changes states to become a gas. But the gas is trapped inside the log. Pressure builds as the gas gets hotter until at some point the wood gives way with a *pop* and the hot gas escapes.”

Just then they heard footsteps, and Dr. Forester appeared in the firelight. “Those little fossil bones are very interesting,” she said. “I’m thinking they might belong to a small dinosaur, rather than an ancient **mammal** or bird, but unfortunately I don’t have enough pieces yet to be sure.”

“I want to look at them!” Julian said, jumping up from his chair and heading for the lab.

Dr. Forester caught him by the shoulder. “If you don’t mind, Julian, let’s wait until morning. It’s really time for everyone to head for bed.”

Julian shrugged and **reluctantly** said, “Okay.”

As Amy walked with Kristal and Daria to their tent, she suddenly remembered the snakes. Were snakes coming out of their daylight hiding places now that it was cooler? With one eye peeled for anything slithery, Amy brushed her teeth with water in a cup and spat the minty foam onto a rock beside the tent. Then she checked to make sure there was nothing in her sleeping bag before crawling inside.

Daria and Kristal were quickly asleep, but Amy lay stiffly on her cot, listening for rustling sounds. Finally, she got up and shone her flashlight into every corner of the tent, under all the cots, and then zipped up the tent flap. She was pretty sure there was no other way for snakes to get in.

Even then, though, sleep refused to come. Amy flicked on her flashlight and pulled out one of the books she had brought along: *The Mystery of the Old Masters*. She had read the book many times, but she never tired of reading how Inspector Ellis figured out who’d stolen the priceless paintings. She thought it was clever the way the Inspector kept track of clues on a small notepad and consulted this list often. After finishing the first chapter, Amy felt better. She just wished that instead of Fossil Camp she could have gone to Detective Camp, if there was such a thing.

Chapter 3

A Fossil Goes Missing

THE BIG QUESTION
How do we keep track of all the elements?

"Dr. Forester doesn't look very happy this morning," said Felix as he poured milk on his instant oatmeal and passed the carton to Amy. She followed Felix's gaze. Dr. Forester was standing outside the lab with Tess, gesturing and shaking her head.

Matt **slathered** butter on a piece of toast. Julian had made himself a peanut butter sandwich, and Daria was munching an apple. The only one who wasn't eating was Kristal. Wearing her dark glasses, she silently sipped a cup of hot tea. Before breakfast, Kristal had been sitting on her cot, working on a sketch. When Amy had asked to see what she'd drawn, Kristal had pulled her sketchbook tight to her chest. Amy had wondered why Kristal would be so secretive about her drawings.

Dr. Forester finally came over, poured herself a mug of coffee, and joined them at the table. "One of the little fossils from the gully seems to be missing." She lifted the cup but set it down again without taking a swallow. "I could have sworn there were six fossils, but this morning there were just five on the table in the lab."

"Did you search the tent?" Julian asked.

Dr. Forester nodded. "And now Tess is searching again. The thing is, I could be mistaken about the number of fossils. There might have just been five to start with. Still, it's a bit of a mystery."

At the word *mystery,* Amy started to tingle all over. A missing fossil? Now *that* was something she could get interested in! Amy thought about Inspector Ellis and his notepad. She suddenly remembered she'd tucked a

small notebook inside the front pocket of her backpack just before she and Matt had left home. It would be perfect for recording any clues she might uncover regarding the missing fossil.

“Excuse me,” she said, pushing her chair away from the table. “I need to get something from the tent, but I’ll be right back.”

Amy sprinted to the tent and retrieved the notebook from her backpack along with a mechanical pencil. As she turned to leave, she spotted Kristal’s sketchbook lying on her cot. Before Amy realized what she was doing, she opened the sketchbook and quickly flipped through the pages until she came to one full of detailed drawings of the little fossils from the gully. There were drawings of six different fossils, not five. So there *was* a fossil missing! Amy put Kristal’s sketchbook back where she had found it, and hurried back to join the others.

On the drive out to the dig site, Amy clutched her notebook, lost in thought. How had the fossil gone missing? Had someone taken it? And why hadn't Kristal mentioned her drawings to Dr. Forester?

"You look better today, Sis," Matt said, interrupting the stream of questions running through Amy's head. "Yesterday you seemed pretty unhappy."

Amy smiled at her brother. '*Today is different,*' she thought. '*Today there's a mystery to be solved.*'

***

When they arrived at the dig site, Dr. Forester suggested they spend the morning continuing their excavations. After lunch, when the afternoon sun was turning the narrow plateau into a **furnace**, they'd scour the gully. "Maybe we'll be lucky and find more small fossil bones," she explained.

Amy noticed that this plan seemed to please everyone, especially Julian. He pulled out his pick and brush and set to work before anyone else. After a while, he paused and looked over at Tess. "Yesterday you were talking about how matter can change states. But what makes one kind of matter different from another? What makes this pick different from, say, the rock or the fossil bones?"

Tess rocked back on her heels, wiping the sweat from her brow. "Before I can explain that, we need to fill in a few background details. Remember when I said that matter was made up of small particles? Those particles are called atoms, which are so small they are invisible to the naked eye. There are more than a hundred different kinds of atoms, and each kind is called an element."

"But aren't **atoms** composed of even smaller particles called protons, neutrons, and electrons?" Daria asked.

"Indeed they are," Tess agreed, "but an atom is the smallest amount of any element that still has the properties of that element. Elements, then, are the basic substances that make up all matter—think of them as the basic ingredients of matter. All the known elements are arranged on something called the **Periodic Table** of the Elements."

“We have one of those hanging on the wall of our science classroom this year,” Kristal said.

“Excellent!” exclaimed Tess. “Then you may have noticed that each element has a name and a symbol made up of one or two letters. For example, oxygen is an element and its symbol is O. The element nitrogen’s symbol is N, and the element aluminum’s symbol is Al. The elements are arranged on the Periodic Table based on their properties and certain patterns in their atoms.” Tess grabbed her rock hammer and held it up. “And that brings me back to your question, Julian. The elements are often divided into two basic groups: metals and nonmetals. The head of this hammer is mostly made up of the element iron.” She flipped the hammer upside down. “The wooden handle is made up mostly of nonmetal elements, such as carbon, nitrogen, sulfur, and phosphorus.”

Felix suddenly pulled out all his digging tools and arranged them in a line on the ground. “Ever notice how metal objects make a nice sound?” he asked with a mischievous look on his face. He began tapping his chisel against all the other metal objects, like he was playing the drums. Each one gave out a *clang* when he struck it.

“If paleontology doesn’t work out for you, Felix, you might have a future as a musician,” Matt joked. “Then again, maybe not.”

Felix made a face at him.

“Felix is right, though,” Tess broke in. “That ringing sound—scientists call it **resonance**—is a property of metals. Being shiny is another. So is being malleable and ductile, which means that you can hammer metals into shapes and stretch them out into long, thin wires. And, if you’ve ever seen the inside of electrical cord, you’ve probably noticed the metal wires inside. Another property of metals is that they are good **conductors** of electricity and heat.”

Tess picked up a piece of sandstone and set it out on a flat space beside her. “Nonmetals, on the other hand, have very different properties. They tend to break or crumble, not bend.” She hit the rock with her hammer and it shattered into pieces. “They also don’t conduct electricity, they are usually dull rather than shiny, and they lack that lovely resonance.” She tapped her hammer on her water bottle and it made a dull *thunk*.

Amy noticed that Dr. Forester had been listening to Tess, but she'd suddenly walked over to the far end of the plateau. Now she was returning—in a hurry.

"Change in plans, everybody," she said, breathlessly. "There's a storm coming." She turned and pointed toward the northwest, where a line of dark clouds hugged the **horizon**. Even as Amy watched, the clouds seemed to expand and move closer.

"I'm afraid it's moving directly toward us," Dr. Forester said, untying the lines that held the tarp over the dig site. "And when it hits, we don't want to be standing up here, exposed on this plateau."

"Why is that a problem?" Kristal asked.

Tess summed it up in one word. "Lightning."

Kristal's eyes grew wide. "So we're going to back camp, where we'll be safe in the tents?"

"Weren't you listening to the chemistry lesson?" Felix called out as he ran over to help Dr. Forester with the tarp. "The tents have metal poles, and metals conduct electricity."

"At home we go into the basement when a bad storm is coming," Daria said in a **tense** voice.

"And in a way," said Dr. Forester, stuffing the folded tarp into her backpack, "that's exactly what we are going to do. Everyone, grab your gear and follow me." She led them to the spot where Felix had slid down into the gully. The wind was blowing much harder, and the storm now covered half the sky like a huge, black curtain sweeping toward them.

"Yesterday when I was walking along the gully, I spotted a shallow cave near the end of this ridge." Dr. Forester had to shout to be heard above the rising wind. "Climb down carefully; it's slippery."

"You can say that again!" yelled Felix.

Amy kept her eye on the storm as they hurried along the dry gully. Bright chains of lightning zigzagged through the steely gray clouds that were quickly approaching, and she could hear the deep rumble of thunder.

By the time they reached the cave, the storm had blotted out the sun. They scrambled up the rocky hillside and stepped beneath the cave's sheltering overhang just as the first raindrops began to fall.

"Move to the back," Dr. Forester shouted above the booming thunder. They huddled together in the deepest corner as the storm struck. Rain fell in great, swirling sheets. Bolts of lightning flashed and thunder crashed so loudly that Amy had to cover her ears.

Gradually, the rain began to let up. The rumble of thunder grew more and more distant as the storm slowly moved off. Dr. Forester stepped to the front of the cave and the others followed.

"Everything looks so much more colorful," Kristal said, as the sun came out, "like the rain washed it clean."

"It might have done a lot more than that," Dr. Forester mused. "Rain erodes these rocky ridges and loosens fossils hidden inside them. Sometimes," she paused and looked thoughtfully at the gully below, "it washes fossils down off the ridges into low spots."

Felix was the first to understand. "You mean—we might find more of those strange little fossil bones in the gully below the dig site?"

Dr. Forester gave a quick nod. "Exactly! So, if you all don't mind getting your boots a little muddy, let's go on a fossil hunt!"

Chapter 4

Who's Hiding What?

THE BIG QUESTION
What is the difference between gold and fool's gold?

"Let's all spread out," Dr. Forester suggested as they reached the stretch of the gully below the dig site. "Keep your eyes peeled for anything that looks like the small fossil bones we found yesterday."

Everyone fanned out across the width of the gully, and with heads bowed, began scanning the rocky ground. Daria picked up something, frowned, and dropped it again. Then she **prodded** the rocky soil with the tip of her finger. "Wow, everything is sure drying out quickly," she said. "What happened to all that rainwater?"

"Some of it soaked into the ground," Tess replied. "But some of it evaporated and changed to water vapor that has mixed with the air. Remember, though, that physical changes are reversible. High above the earth's surface, the air is much colder. When water vapor encounters cold air, it loses heat and **condenses**. It changes states from a gas back to a liquid, forming tiny droplets of liquid water. Those tiny droplets in the air form clouds. If the droplets are big enough, they'll fall back to earth as rain."

"You mean we might get another thunderstorm?" Kristal eyed the sky warily.

"It's possible, but I'm guessing it won't rain again for quite a while," Tess replied. "I think the excitement is over for today."

Just then, Julian let out a shout. "Don't be so sure, because I just found gold! **Eureka**!"

Everyone rushed over to see the gleaming, dark, yellow rock that Julian held in the palm of his hand.

"I'm not only going to be famous," Julian said, triumphantly, "I'm going to be rich. Just look at the size of that nugget. My dad is going to be so proud of me!"

Dr. Forester examined Julian's find carefully. "Sorry to disappoint you, Julian. I'm afraid what you have there isn't gold but a very common type of rock called iron pyrite."

Julian's face fell. "You're absolutely sure?"

Tess laid a comforting hand on his shoulder. "You're not the first person to make that mistake, Julian. In fact, iron pyrite is often called fool's gold for that very reason."

Amy could tell Julian was very disappointed that his great discovery turned out to be nothing. He didn't say anything as he took the rock back from Tess and shoved it deep into his pocket.

A few minutes later, Matt stopped and nudged something with the toe of his shoe. “Hey, what about these?” Everyone rushed over and watched as Dr. Forester knelt down and then picked three more fossils out of the gravel.

“Maybe these will help me figure out just what kind of animal we have,” she said excitedly.

“Can we get back to the dig site now?” Julian blurted out in a loud, impatient voice. It was clear he didn’t want to look for small fossils anymore.

“It *is* almost noon,” Tess acknowledged, “so let’s break for lunch.”

They climbed up the slope to the dig site and retreated to the far end of the plateau again to eat sandwiches and fruit. Amy made a point of sitting next to Kristal. She unwrapped her sandwich but then laid it aside as she leaned in to ask the question she’d wanted to ask all morning. “Why haven’t you shown Dr. Forester your drawings of the little fossils yet?” Amy whispered. “If you did, she’d know there really is one missing.”

Kristal’s eyes went wide with surprise. “How did you know about my drawings?”

“I admit I peeked at your sketchbook,” Amy confessed, “but you can’t keep this information quiet. You need to let Dr. Forester know.”

Kristal was silent for a while. “Okay, I promise I will, but only—only if there is no one else around. Otherwise, people will make fun of my drawings.”

“No, they won’t!” Amy gasped. “You draw really well.”

Kristal suddenly looked past Amy with a surprised look on her face. “Hey, your sandwich!”

Amy turned just in time to see a small animal with narrow stripes making off with part of her sandwich. “You little stinker,” she said, laughing as the animal disappeared into a crack in the rocks far above them.

“Those little ground squirrels are all over these badlands,” said Tess, chuckling. “They are very good at stealing food. I’ve known them to make off with other small objects they think might be food, too.”

After lunch, they returned to excavating Achy-Breaky’s bones. Matt had already exposed three of the dinosaur’s fossil teeth. Amy was making much slower progress because her mind kept wandering back to the missing fossil bone.

“We’re never going to get this jawbone excavated if you keep staring off into space,” Matt said quietly, glancing up at his sister.

“I know, I know,” Amy said, hurriedly picking up her brush to sweep away the bits of rock dust she’d created. “But I can’t stop thinking about that missing bone.” She told him about Kristal’s drawings.

“Maybe Dr. Forester simply mislaid it,” Matt suggested, “like Dad does with his car keys all the time. There’s no evidence someone took it, and why would they?”

Amy had to admit that Matt's question was a good one. She glanced around at the group. Everyone was hard at work—except Felix, who just at that moment took something out of his pocket and popped it into his mouth! Felix noticed Amy staring and swallowed hard, gulping down whatever it was. He cleared his throat and suddenly turned to Tess. "I was wondering, Tess, just what is the difference between gold and fool's gold?"

Amy thought Felix just asked the question to turn her attention away from him.

Tess didn't notice, though, and was happy to answer it. "Remember that atoms are the smallest particles of matter. The thing is, you don't find many atoms all by themselves in nature. Atoms typically join together, or **bond** into groups of two or more to form **molecules**. Some molecules are made up of atoms of just a single element. A lump of gold, for example, would be made up of many gold atoms bonded together.

"Most molecules, though, are combinations of two or more different elements. A molecule of iron pyrite, for example, has two atoms of the element sulfur bonded to an atom of the element iron. Molecules that contain atoms of two or more different elements are called compounds. Water is another example of a compound. A water molecule is made up of two atoms of the element hydrogen and one atom of the element oxygen."

"Is that why people sometimes call water *H-two-O*?" Daria asked.

"**Precisely**," Tess replied. "There are millions of molecules that are compounds, and you can find them everywhere and in everything. This sandstone rock we're scratching away is made of molecules that are compounds. So are these dinosaur fossils, and the tools we're using. Each one of you is a walking, talking collection of different compounds that make up your bones, muscles, nerves, and everything else in your bodies."

Dr. Forester suddenly spoke up. "Okay, here's a riddle: why are all compounds molecules, but all molecules are not compounds?"

"Because some molecules are made up of atoms of only one element!" Matt exclaimed proudly.

“Exactly right,” Dr. Forester said.

Tess was about to continue her chemistry lesson, when Daria pointed at something off in the distance, “Sorry to interrupt, but I think someone’s coming.”

Far off in the distance a black SUV was slowly approaching, bumping along on a barely visible track that wound among the ridges.

“I thought no one lived out here,” Amy said.

“No one does,” Dr. Forester replied, “but maybe these people are lost.” She dug a pair of binoculars out of her backpack and trained them on the distant vehicle.

As they all watched, the vehicle stopped, then quickly turned around and headed back in the direction from which it had come.

“That was strange,” Julian said. “It’s like they suddenly saw us and turned around.”

Amy thought it was strange, too. What was even stranger, though, was the look Dr. Forester and Tess exchanged as the black SUV drove away.

Nothing else disturbed their work for the rest of the day, and Dr. Forester was very pleased with their progress. As the sun started to sink in the western sky, they packed up their gear and said good-bye to Achy-Breaky for another day. Back at camp, Tess grilled hamburgers over the open campfire and heated baked beans in a cast iron pot.

After dinner, Dr. Forester put them all to work in the lab, helping her measure the little fossils from the gully and use the balance to determine their mass. Amy kept giving Kristal encouraging looks, hoping she would show Dr. Forester her sketches, but Kristal just kept shaking her head.

“Can you tell what kind of animal it was yet?” Julian asked, as they were putting all the instruments away.

“Well, this is a part of a leg bone,” Dr. Forester said, pointing at one of the fossils. “And this one looks to be part of a vertebra, or a piece of the backbone. But I’m still not sure what we have. It’s never a good idea to jump to conclusions.”

And then it was time for bed. Amy caught up to Kristal as she was heading to the tent.

“I know, I know,” Kristal whispered. “I promise I’ll show my sketches to Dr. Forester tomorrow. I need to get my courage up.”

Kristal fell asleep within minutes, but Amy decided to read until Daria came in. She finished one chapter and then another, but Daria still hadn’t come. Amy peered out through the tent flap and looked around at the silent camp. Everyone else was asleep as nearly as she could tell. Amy sat on her cot and began to worry. What if something had happened to Daria? What if she’d been bitten by a snake? Just as Amy was about to tug on her sweatshirt and shoes and go in search of her, Daria came bouncing into the tent with a huge smile on her face.

“Where have you been?” Amy hissed. “I was starting to worry.”

“Um! Ah—I went for a long walk!” Daria whispered back, sounding strangely excited.

“In the dark?” Amy asked.

“Oh—um—I used the flashlight on my phone,” Daria said quickly. “Good night!” She spun on her heel and headed for her cot.

Amy lay awake, thinking about Daria’s strange behavior, Felix’s secretive snacking, and the odd look Tess and Dr. Forester exchanged when the black SUV appeared. Perhaps they were clues to the missing fossil. She pulled out her notebook and by the light of her flashlight, listed them one by one. No matter how many times she read through the list, however, she couldn’t make sense of any of them, and finally decided, like Dr. Forester had with the small fossils, that there wasn’t enough evidence to draw any conclusions. But from now on she was going to keep a closer eye on Daria—and Felix.

Chapter 5

Sketches and Secrets

THE BIG QUESTION
What do the sea and sweet tea have in common?

The sun looked like an angry red ball on the horizon when Amy got up. It was going to be another scorching hot day.

Tess had put out boxes of different kinds of cereal on the table, along with fresh and dried fruits and nuts. Amy sprinkled a few blueberries on her wheat flakes.

"Could you pass those, please?" Felix asked. Amy did and then stared as Felix dumped a handful of blueberries on top of all the things he had already heaped onto his cereal: raisins, sliced bananas, almonds, dried cranberries, peanuts, grapes, and flakes of dried coconut.

Felix noticed Amy staring. "What?" he asked, looking down at his bowl. "I always do this with cereal. It makes it more interesting and better tasting, too." He began stirring all the ingredients together with his spoon.

Tess tried to hide her smile. "Well, all I can say is that is quite a **mixture** you've got going there, Felix, at least in the chemical sense of the word."

"What do you mean?" Matt asked.

"In chemistry," Tess replied, "a mixture is made from two or more substances that are physically mixed together but can still be separated."

"You mean that I could pick out all the raisins," Felix said, plucking a raisin from the bowl and popping it in his mouth, "and all the nuts and all the banana slices and cereal pieces and so forth."

Tess nodded. "And no matter how much you stirred the—er—mixture in your cereal bowl, all the different types of matter wouldn't change. They would still have the same properties that they had before you mixed them together."

Kristal had added a spoonful of sugar to her tea and was stirring it in. "But mixing sugar into tea is different, right?"

"Not really," Tess said, "because what you are making there is a solution, which is actually a special type of mixture. Solutions are formed when one substance is mixed into another and **dissolves**. It might look like the sugar disappears, but it really just turns into particles so small you can't see them in the liquid."

"But if sweet tea is a mixture, you should be able to separate the tea from the sugar, and I don't see how you could do that," Matt said.

"Actually you could," Tess replied. "It wouldn't be as easy as picking raisins out of cereal. But if you let all the liquid evaporate, the sugar would be left behind as tiny crystals."

"That's like what happens when you go swimming in the ocean and don't rinse off afterwards," Daria added. "The seawater evaporates, leaving little crystals of salt on your skin."

"Seawater is a solution that has lots of things dissolved in it," Tess agreed, "but especially a lot of salt!"

"Here comes Dr. Forester," Julian said. Amy got the impression he had been waiting for her, and when she sat down, he asked again if she'd had any luck figuring out what kind of animal the small gully fossils had belonged to.

Dr. Forester shook her head, but she was smiling. "The more I look at those little bones, though, the more excited I become. One of the three new pieces we found yesterday was especially interesting. From its shape and texture, I am quite sure it's from a small dinosaur."

Amy shot a hard glance at Kristal, who started to shake her head but then nodded and coughed softly. "Um, Dr. Forester," she said, producing the sketchbook she'd been holding on her lap, "I wanted to show you some drawings I made of the first little bones found in the gully." She flipped open to the drawings Amy had seen, and turned the book around so Dr. Forester and everyone else could see.

"These are very professional!" Dr. Forester exclaimed. "Kristal, you've captured the details well!"

"Thanks," Kristal said, embarrassed but obviously pleased. "But I wanted you to see them for another reason. You and Felix found six fossils that first day, not five, and my drawings prove it."

Dr. Forester studied Kristal's sketches for a long moment. "So one of them *is* missing," she said softly. "I'm hoping it will turn up, but until it does, I'd like to use your drawings, Kristal, when I study the fossils tonight."

As they were packing up to head out to the dig site, Matt pulled Amy aside. "So, what do you think happened to the missing fossil? Have you uncovered any clues as to where it might be?"

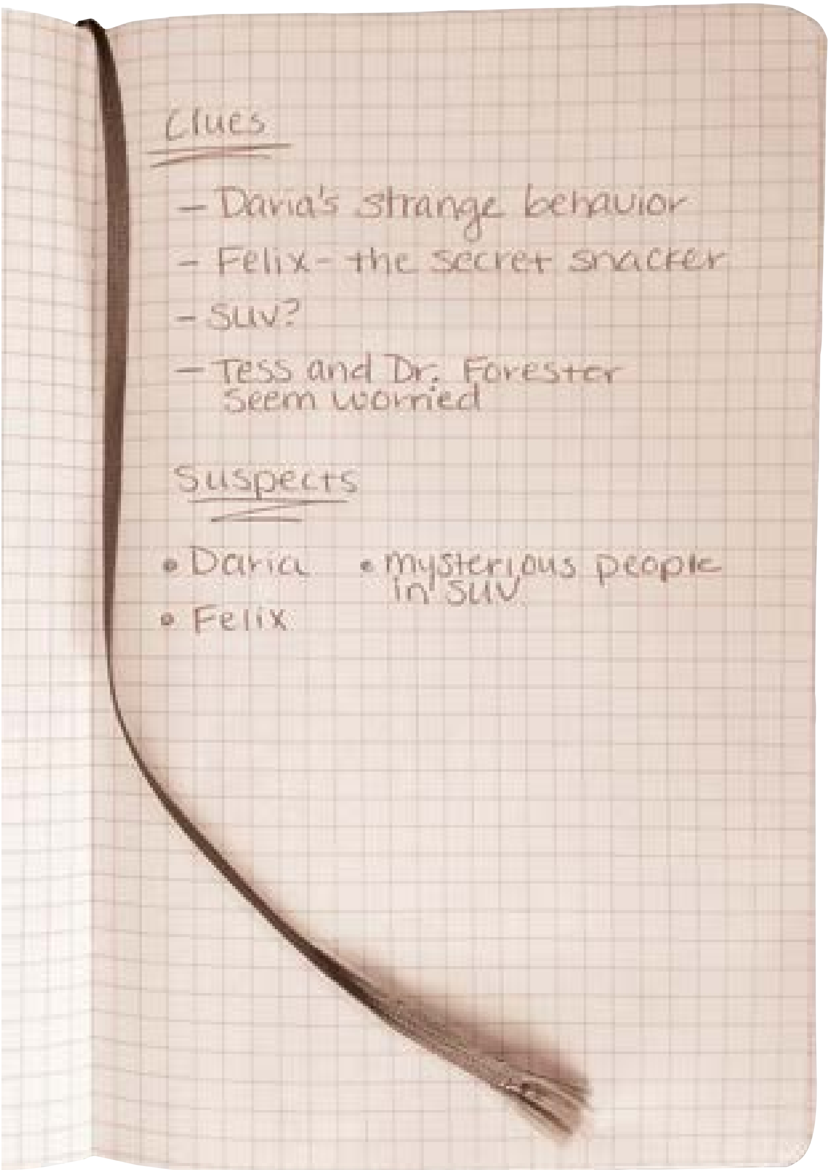
"I really have no idea, at least not yet. But it's not the only odd thing that's happened around here." She told her brother about Daria being gone for such a long time the previous night.

"Hmmm," Matt mused, "that does sound a little **suspicious**. Something strange happened in our tent last night, too. Felix has a huge backpack that's absolutely stuffed. Last night I was scooting it under his cot to make more room in the tent and he said he didn't like anyone touching his things. And now this morning," Matt's voice fell to a whisper, "there's a lock on it. Who puts a lock on a backpack?"

"Someone with something to hide?" Amy arched one eyebrow. "But why would Felix steal a fossil?"

Matt smiled and mussed Amy's hair. "When you figure that one out, let me know."

It was day three of their paleontology adventure. Felix and Daria had



removed nearly all the rock from around the cluster of backbones. Kristal and Julian were making good progress on excavating the bones of the dinosaur's foot. Amy could see that Matt would have the rock cleared away from his half of the jawbone by the end of the day. If she didn't work faster on her half, she'd be holding things up. Amy tried to put the mystery of the missing fossil out of her mind and concentrate on scraping and sweeping the crumbly rock away.

As more and more of the dark, gleaming fossil was revealed, Amy remembered something Tess had said when they first arrived at Fossil Camp.

“Tess, remember when I asked you what a fossil was?”

“Ah, yes, so you did.” Tess said, straightening up. “Now that you all understand a little chemistry, I’ll give you a more complete answer.”

Everyone put down their tools and stretched, happy for a break.

“Different kinds of fossils form in different ways,” Tess began, “but these dinosaur fossils formed as the original compounds in Achy-Breaky’s bones were replaced by other compounds, thanks to the powerful effects of a solution at work.”

“Like sugar in tea?” Kristal asked.

“In a way,” Tess replied. “When Achy-Breaky died millions of years ago, his body was quickly covered beneath a thick layer of muddy sand. As a result, it didn’t break down, or **decompose**, in the way most dead things usually do. It was preserved for a long time, sealed beneath tons of sand that gradually turned to rock.”

“As time passed, water oozed down through the rock and picked up different mineral compounds along the way. These compounds dissolved in the water, creating a solution. As more and more minerals dissolved in the water, they began to come out of the solution as solids again. Little by little, those mineral compounds settled in tiny spaces in Achy’s bones and teeth. They replaced his original compounds so that what was left at the end of this process were fossilized bones and teeth. And that’s what you are excavating right now.”

“You sure were right, Tess,” said Felix, “when you said that chemistry has a lot to do with paleontology.”

Amy went back to work thinking about the fossils in the rock beneath her hands in a very different way. They weren't just old bones, but the result of amazing changes in matter that had taken place over an incredibly long period of time. They were pieces of ancient history, very real clues to the past. Thinking about fossils in this new way made Amy glad she'd let Matt talk her into coming to Fossil Camp. Even if she didn't solve the mystery of the missing fossil, she was glad they were here.

Hours later, they returned to camp, hot, sweaty, and tired. Tess warmed a big pot of water and set out a basin and towels. "Does anyone want to clean up before dinner?" she called out.

Amy was first in line. Tess poured some warm water into the basin and handed her a bar of soap. As she washed her face and arms, the water in the basin turned cloudy and light brown—the same color as the sandstone ridges. There was a layer of sandy grit at the bottom of the basin. "Wow, was I ever dirty," she said, patting her skin dry with the towel. Amy picked up the basin to toss away the dirty water and exclaimed, "I created a mixture, didn't I?" Tess nodded and laughed as she rinsed and refilled the basin for the next person in line.

After dinner, everyone gathered in the lab. Dr. Forester had laid out all eight of the fossil bones from the gully on a piece of cloth on the big table. "Tonight I want to show you how paleontologists help preserve fossils that are rather fragile, as these tiny bone fragments are." She held up a small brown glass bottle. "This is a special solution, a sort of glue called a consolidant, that we paint onto delicate fossils. Let me show you how it's done." A brush was built into the bottle's lid, and Dr. Forester used it to carefully apply a thin coat of consolidant onto each of the fossils. She explained that the consolidant soaked deep into the fossils, and as it dried and hardened, it would make them stronger and less likely to break.

"These will be dry by morning. Then I'll go back to work analyzing them. If I could just find a matching edge for even just two of them, I might have a large enough piece to say for sure what type of dinosaur this is." She sighed and screwed the lid back on the bottle. "We'll just have to wait and see."

Chapter 6

The Quest for Clues

THE BIG QUESTION
What are chemical reactions?

When Amy arrived at the breakfast table the next morning, it was obvious that something was wrong. Tess and Dr. Forester both looked tense, and no one at the breakfast table was talking. For once, even Felix was quiet.

Amy slipped into the chair beside Matt and asked softly, "What's going on?"

"Not sure," Matt whispered back. "They said they have something important to tell us but wanted to wait until everyone was here."

Julian was still missing. They all waited in silence until he finally came running up, **flushed** and breathless. "Sorry," he said, taking the last chair, "I overslept."

Dr. Forester clasped her hands on the table in front of her. "I'm afraid that Tess and I have some disturbing news. This morning when I went into the lab to see if the consolidant I applied to the gully fossils last night was dry, I discovered that they were gone."

"Gone?" Amy exclaimed, her heart suddenly pounding.

"All of them?" Felix asked, wide-eyed.

"Yes, every single one. We've looked everywhere, of course, but haven't found any **trace** of them. I can only conclude that someone took them during the night." She paused, and looked hard at each person at the table, one by one. "Did any of you see or hear anything strange last night?"

Amy shook her head and shot a glance at her fellow campers. They all seemed **genuinely** upset and denied seeing or hearing anything other than the rhythmic creaking sounds of crickets and the soft sigh of the wind.

"Then I can only conclude," Dr. Forester said with a heavy sigh, "we were the victims of very clever fossil thieves."

"People steal fossils?" Matt was **incredulous**. "Who'd want to make off with dinosaur bones?"

"Oh, you'd be surprised," Dr. Forester said grimly. "Fossil hunters supply museums and private collectors all over the world. Most are honest people who obey the laws about where and how they can collect fossils. But unfortunately there are also some unscrupulous characters who dig up fossils on protected land without permission, or"— she paused—"steal them from paleontologists' dig sites."

"Since none of us heard anything," Dr. Forester continued, "I'm guessing the thieves parked their vehicle some distance from camp and then slipped in and out of camp on foot."

"That SUV we saw yesterday," Felix mused. "That was pretty suspicious. Do you suppose the thieves were in the SUV? Maybe they were spying on us?"

Dr. Forester shrugged. "It's possible, Felix, but it's just as likely that what we saw was nothing more than a car turning around."

"What if the thieves come back?" Daria asked, nervously.

For the first time that morning, Dr. Forester smiled. "That is the good news. I doubt very much that they will because they took the only fossils we have here at camp right now. I can't imagine they'll return."

"Shouldn't we call the police or something?" Matt asked.

"Well, there aren't really police out here," Tess said, "at least not like there are in a city. But Dr. Forester and I are discussing what to do."

Tess served eggs and bacon, which put everyone in a better mood. But while the other campers chatted excitedly about fossil thieves and stolen bones, Amy was trying to think like Inspector Ellis. She guessed that the big thunderstorm that had washed the little fossils into the gully had also smoothed away any old tracks and footprints on the ground around camp. If fossil thieves had parked a vehicle nearby and walked into camp during the night, there should be clear sets of new tire tracks and boot prints to be found. She added this possibility, followed by a question mark, to the list in her notebook.

Amy slipped out of camp while the others were busy making lunches and packing up the excavation gear. She circled the cluster of tents at a distance, scanning the ground in open areas and dry gullies wide enough for a vehicle to drive along. Wherever she looked, the sandy soil was rain-flattened and smooth. Except for tiny footprints she'd guessed were made by ground squirrels and rabbits, there were no signs that anyone had approached their camp from the outside the night before.

Finding no clues is a clue in itself, Amy thought.

Convinced she'd made a thorough search, Amy headed back to camp. She was **weaving** around several clumps of tall grass when someone suddenly shouted, "STOP!"

Amy froze as Julian appeared off to her left, hurrying toward her. "Don't take another step, Amy!" he called out. "Stay absolutely still!"

She was about to ask why when she saw the snake emerge from a big clump of grass not five feet ahead and start **slithering** toward her. Amy's mouth went dry, and cold sweat beaded her skin.

Out of the corner of her eye, Amy saw Julian pick up a rock the size of a baseball. "I'm going to toss this rock so it lands between you and the snake," he said worriedly. "Hopefully, the snake will go in the opposite direction and head away from you."

Hopefully? Amy thought, as her heart thumped harder.

“Are you ready?”

Amy wasn’t sure she was, but she took a deep breath and said “Ready!” in a tight, squeaky voice.

Julian chucked the rock and it landed exactly where he’d said it would. The snake stopped, tensed, and then turned and wriggled away, leaving a thin, S-shaped track in the sand.

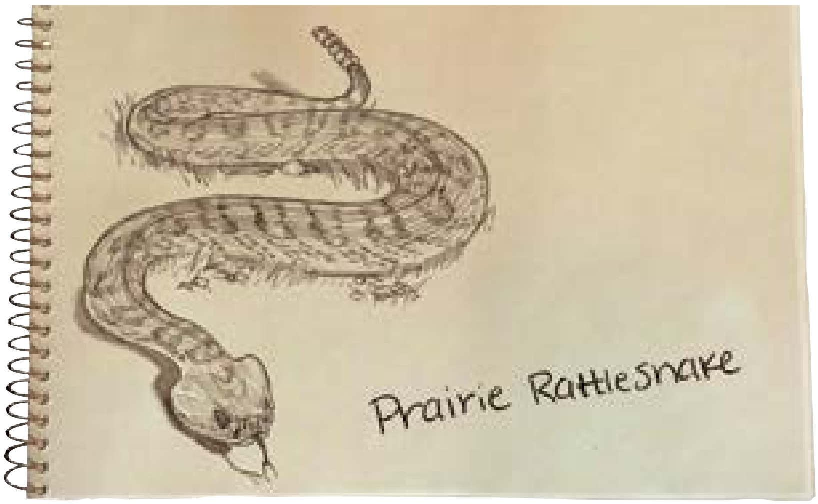
Amy’s breath went out of her in a huge rush as Julian came running up. “That was too close,” she said in a hoarse voice. “If you hadn’t stopped me right then—anyway, thanks.”

“You’re welcome.” He looked around and then back at Amy. “What are you doing way out here?”

“I was looking for tire tracks and footprints,” Amy admitted, “to see if I could spot where the fossil thieves had parked their vehicle and where they’d walked into camp.”

“Oh,” Julian said, looking at her and then quickly glancing away. “Did you find any?”

Amy said she hadn’t, and then something occurred to her. “So, Julian, what are you doing out here?”



“It was—it was getting time to leave and—I spotted you out here so I thought I’d come and get you.” The words tumbled out of his mouth in a sudden rush.

“Well,” Amy said, watching him closely, “it’s a good thing you did.”

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“Where did you disappear to this morning?” Matt asked later that day, as he twirled his rock pick between his dusty hands.

“I was looking around the camp for evidence of fossil thieves,” Amy murmured.

“What did you find?”

“Not a single boot or tire print, and that can only mean one thing.”

“Which is—?” Matt looked at Amy questioningly.

She leaned closer and dropped her voice to a whisper. “That the thief is one of us!”

Just then, Tess clapped her hands to get their attention. “You’re almost ready for the next stage of the excavation process, which is removing the bones you’ve exposed from the rocks beneath them. This morning, Dr. Forester and I are going to show you how that’s done.”

They gathered around Dr. Forester, where she knelt by the leg bone she and Tess had been excavating. “The challenge in removing fossil bones from the underlying rock is to make sure we collect them without breaking them. If we tried to **pry** or chisel them out from underneath, we’d almost certainly break them. Instead, we use a clever technique called trenching. Take a look,” she said, gesturing to the leg bone.

“After the entire bone was exposed on top, we started carefully chipping away the rock all around, about six inches out from the fossil. We chiseled down for several inches—well below where we think the underside of the leg bone is—and then started chiseling inward. As you can see here, what we've ended up with is our leg bone fossil sitting atop a narrow rock pillar."

"It looks like a mushroom," Kristal said.

"That's a very good description," Dr. Forester said. "Once we have this mushroom shape, we put what's called a plaster jacket around the mushroom cap."

Tess continued, pulling on a pair of thin, latex gloves. "I'm going to demonstrate how paleontologists make a plaster jacket. It's a little like a doctor putting a plaster cast on someone's broken arm."

"I broke my arm and had a cast once," Daria said.

"Then you'll know what this leg bone is going to feel like," Tess joked. She had set out a bucket, a jug of water, a roll of paper towels, a wooden spoon, long strips of a rough fabric, and a bag labeled plaster of paris. "First, I'm going cover the fossil with damp paper towels," Tess explained, laying several wet towels on the exposed bone. "That will keep the plaster from sticking directly to our fossil."

"Next, I'll mix a white, powdery compound called plaster of paris with enough water to make a thin paste." Tess added water to the plaster in the bucket and used the wooden spoon to stir the two ingredients together.

"It looks like runny, white frosting," said Felix, leaning over to peer into the bucket.

Tess held up a strip of the rough fabric. "Now I'll soak strips of this burlap in the wet plaster and then lay them onto the fossil." She fitted and wrapped the mushroom cap with plaster-soaked strips until the fossil was completely **encased**, except for the place on the underside where it was still connected to the little pillar of rock. "Now we wait for the plaster to harden."

"But won't it take a long time for all the water to evaporate so it dries?" Amy asked.

“Actually the water isn’t evaporating, Amy. Evaporation is a physical change in matter—a change in states. Here, the powdery plaster and the water I added to it are undergoing what’s called a chemical change in matter. Remember that a physical change may alter some properties or the appearance of a substance, but it doesn’t change what the substance is actually made of—its chemical composition. When matter undergoes a chemical change, however, its chemical composition does change. Typically, molecules of the starting substances break apart, and the atoms rearrange themselves to form new molecules of different substances.

“After a chemical change takes place, you end up with new types of matter, often new compounds, with different properties than those you started with. In this case, the plaster dust and the water are combining in a chemical change to produce a new type of matter: solid, hardened plaster.”

Tess set the bucket of wet plaster in the middle of the group. “Unlike physical changes in matter, many chemical changes are not reversible. In other words, they can’t be undone. Another clue that a chemical change is taking place is that energy is used up or given off in the process, often in the form of heat or light. With that in mind, I want you all to put your hands on the outside of this bucket and tell me what you feel.”

Everyone leaned in and did just that. “It’s warm!” Kristal marveled.

“When a mixture of plaster of paris and water undergo a chemical change, heat is given off,” Tess explained,“enough heat to make the plaster quite toasty as it hardens!” She stood and peeled off her latex gloves.

Tess suggested they all eat lunch while the plaster jacket finished hardening. When they returned, Dr. Forester knocked on the jacket with her knuckles. “Good and solid. Now, Tess and I will break the cap off the mushroom, so to speak, and plaster over the hole on the bottom, just like we did the top.”

While Tess gripped the jacket firmly, Dr. Forester used a hammer and chisel to break it free from the rock pillar. They flipped the jacket over and then applied more strips of plaster-soaked burlap to the bottom. When they were finished, the fossil was completely enclosed and looked like a huge, white egg.

“When it’s dry,” Tess explained, “we’ll use permanent marker to write a fossil number, the date, and the location of the dig site on the jacket. Then we’ll take it back to camp.”

“Actually, I’d like us to stop working a little early today,” Dr. Forester said. “Tess and I have been talking about our missing fossils, and I’ve decided to drive over to Dry Creek and tell the sheriff what happened. It’s a long drive, so I’ll stay overnight. I’ll ask the sheriff to come back with me tomorrow morning and take a look around.”

“Wow, a sheriff!” Felix exclaimed. “Just like the Old West. Those fossil thieves had better watch out!”

Tess asked Julian and Amy to help her carry the jacketed fossil bone down to where the two pickups were parked. As they set it gently into the back of one, Amy realized that Julian had hardly said a word since the snake incident that morning. When Tess headed back up to the dig site, he just stood by the pickup and kicked at one of the tires.

“Thanks again for saving me from the snake,” she said. “I don’t know what would have happened if you hadn’t shouted at me.”

Julian was silent for a long moment and then asked, “What do you think the sheriff will do to the fossil thieves if he catches them?”

Amy shrugged. “I suppose he’ll arrest them.”

Julian didn’t say anything at all.

Chapter 7

The Clues Add Up

THE BIG QUESTION
How do you use chemistry to catch a thief?

“There is nothing like a great dinner after a long, hard day in the field.” Felix patted his flat stomach as he lounged in a camp chair beside the fire. “I’m stuffed.”

They were all sitting around the campfire again, listening to the wood crackle and pop, and watching sparks rise up toward the night sky. It was perfectly clear, and the moon had not yet risen, so the stars were incredibly bright. Amy had never seen so many stars before, but now she could easily see the pale streak of the Milky Way as it rambled across the heavens.

“Too stuffed to eat roasted marshmallows?” Tess asked, walking up with a bag of marshmallows and enough roasting sticks for everyone.

“Wait a minute! I think my appetite just came back,” Felix said. He pushed two marshmallows onto the end of a stick and held them out near the flames.

Tess pulled up a chair and glanced around. “I know it feels a little strange without Dr. Forester here tonight. How about we play a little game to liven things up?”

“You mean like Charades or Twenty Questions?” Daria asked.

“Well, you guys should know me pretty well by now,” Tess said, grinning at them. “I was thinking more along the lines of a good, rousing game of Spot the Chemical Changes!”

“Rules, please!” Amy said, giggling.

“You must identify a chemical change that’s taking place within the **boundaries** of the camp, and explain why it’s a chemical change,” Tess explained. “For every correct answer you get one point.”

“And the person with the most points wins!” said Felix, popping his first toasted marshmallow into his mouth.

Matt’s hand shot up. “The wood in the campfire is undergoing a chemical change, isn’t it? And it’s giving off both heat and light in the process.”

“A point for Matt!” Tess cried. “Yes, when wood burns it is undergoing a very dramatic chemical change.”

“And it’s not reversible, either,” Daria chimed in. “You can’t turn the ashes into wood again.”

“Excellent!” Tess agreed. “Who’s next?”

“As my marshmallows are toasting,” Felix murmured, “they’re turning a delicious golden brown on the outside and they smell heavenly, too. That’s got to be because a chemical reaction is taking place as they’re heating up.”

“A point for Felix!” Tess said. “The sugary substance of the marshmallow is undergoing a chemical change as it gets hot. It changes color and also gives off an odor, both signs that a chemical change is taking place.”

“And you can’t un-toast marshmallows any more than you can un-burn wood,” Kristal said, gently pulling a perfectly roasted marshmallow off her stick and admiring it before taking a bite.

“Digesting marshmallows and other food has got to be a chemical reaction, too,” Amy offered. “And we know the changes take place because our bodies grow and we get energy from the food we eat.”

“A point for Amy, who is absolutely correct that all sorts of chemical changes take place in our digestive tracts,” Tess said. “As we eat these marshmallows, for example, compounds in them are broken down in our stomach and intestines. During this process, atoms are rearranged to form entirely different molecules that our bodies use as building blocks for making substances, carrying out tasks, repairing **cells** and structures, and much more. Certain chemical changes that take place in cells are responsible for capturing energy released when compounds from food are broken down even further, and then converting that energy into a form that cells can use." Tess pulled a marshmallow off her roasting stick, letting it cool slightly. "Just think—there are trillions of cells in our bodies, and at any given moment, countless chemical changes are taking place in each one."

"I've got one," Kristal said, slipping a ring off her little finger. "My mom gave me this silver ring. She'll shine it up for me now and then with a special cloth, but within a couple of weeks it gets a little dull, like there is dirt on it. **Tarnishing**—that's what she called it. Is tarnishing a chemical change?"

"It certainly is," Tess said, "and it typically happens when molecules on the surface of a silver object interact with sulfur-containing compounds in the air. Unlike wood burning or food cooking, chemical changes such as tarnishing take place quite slowly. Definitely a point for Daria!"

As the game continued, Amy noticed that Julian was lost in thought, but he'd been like that all day. Daria, on the other hand, seemed nervous. Every few minutes she turned and looked out into the darkness, in the direction Dr. Forester had driven away before dinner.

Amy thought of Inspector Ellis. In every book, he listed all the clues in his notebook to help him see the case more clearly, just as she had been doing. Amy didn't have her notebook handy, so she picked up a stick and made a sort of list in the sandy soil. She drew symbols that stood for backpacks and disappearances, cell phones and snakes, discoveries and appearances and things people had said.

Inside her head, several clues fell together—click, click, click.

There was a pause in the game, and Amy took advantage of it. She leaned back in her camp chair and let out a huge yawn. "Sorry, everybody," she said. "I'm tired and I'm going to bed. I want to be wide awake and alert tomorrow morning when Dr. Forester comes back—*with the sheriff*," she added, emphasizing the three words. As she stepped past Matt's chair she tugged on his shirt, a signal that he should follow her.

"What's up?" Matt asked, as he joined her where she stood beyond the reach of the firelight.

"I'm doing what any good detective would do. I've put the clues together and come up with a plan."

"A plan for what?"

"A plan to solve the Case of the Missing Fossils," she said softly. "Meet me outside the kitchen tent after Julian and Felix have fallen asleep."

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Amy picked her way slowly across the clearing toward the kitchen tent, trying not to make a sound. The moon had risen in the star-**spangled** sky as a silver **sliver** that gave off just enough light so she could see the shapes of all the tents. She paused and listened outside Tess' tent, but she heard nothing and hoped Tess was sound asleep. As Amy neared the kitchen, a familiar shape detached from the larger shape of the canvas structure.

"What took you so long?" Matt said in a loud whisper. "I've been waiting here for half an hour."

Amy placed a finger gently on her brother's lips. "Not so much noise. I'm late because Daria was tossing and turning and it took forever for her to fall asleep."

"Julian was asleep in record time, but Felix kept fiddling with his backpack for quite a while." Matt swatted at an insect. "So what are we doing here?"

"We're setting a trap for our fossil thief," Amy replied.

"Do you know who it is?"

Amy answered thoughtfully. "A good detective suspects everyone until she has the evidence to prove who did what—and why."


The Plan
- Set a trap
- Use science:
ice cubes / water
plaster of paris
- Suspect(s) may leave
footprints behind
- Examine evidence
80 ml
60
40
20

“Okay, Miss Good Detective—how exactly are we going to do that?”

“Well, I’m guessing that whoever took the fossils is feeling pretty scared right now, because of the sheriff coming tomorrow. It’s just a **hunch**, but I think he or she might try to return the fossils to the lab tent tonight.”

“You mean we have to stand guard here all night and keep watch?” Matt hissed. “Sis, I’m so tired I can hardly keep my eyes open.”

Amy shushed her brother again. “We’re not going to stand guard. We’re going to use chemistry to identify the culprit instead.”

“Chemistry?” Matt asked, in a tone that made it sound like he thought his sister was crazy. “What do we know about chemistry that could help solve a crime?”

“Quite a bit, actually, if you’ve been paying attention over the past few days.” Amy lifted the flap of the kitchen tent. “Follow me.”

She slipped inside and flicked on her flashlight. After grabbing a big bowl and a dishtowel from a shelf, she headed over to the little refrigerator. “First, we need ice,” she said, handing Matt the bowl and laying the towel in the bottom of it. As she emptied the ice cubes from two trays into the bowl, the towel muffled their clatter. She listened for a minute, straining to hear any sounds that might indicate someone else was awake. Except for the crickets, there was silence. “Now, let’s head for the lab,” she instructed.

Amy stopped outside the lab tent and took the bowl of ice cubes from Matt. One by one she placed the ice cubes on the ground directly in front of the tent’s entrance.

“Amy, what on earth are you doing?” Matt asked impatiently.

“I’m exploiting a physical change in matter as the first step in solving the case,” Amy replied. “The ice cubes will slowly melt over the next few hours. They’ll change states from a solid to a liquid, making the ground wet here right in front of the tent. Anyone who enters the lab will get the soles of their shoes nice and damp.”

“So what good do wet shoes do us?” The irritation in Matt’s voice was growing.

“Trust me.” Amy stepped inside the lab, flicked on her flashlight, and shone it where boxes and supplies were stacked in one corner. “Help me find the plaster of paris.”

Matt quickly found the bag of white powder and dragged it into the center of the tent. “Okay, now what?”

Amy handed her brother a pair of latex gloves from a box on a shelf, and put on a pair herself. “Help me scatter plaster dust on the floor of the tent. Let’s start in the far corner and work back toward the entrance.”

“Amy, this is not just crazy,” Matt said, starting to scatter the plaster dust, “but Dr. Forester is going to be very annoyed when she sees this mess.”

“The plaster is the second part of my plan and makes use of a chemical change,” Amy said. “Remember what happened when Tess mixed water and plaster of paris at the dig site today?”

“It underwent a chemical change and the wet plaster hardened.”

“Exactly. So if someone comes into the lab tent tonight, he or she will step in the water from the melting ice cubes just before entering. The soles of this person’s shoes will be wet as he or she starts to walk around—”

“—and the plaster dust will stick to them.” A grin started to spread across Matt’s face. “The plaster and water will undergo a chemical change—”

“—and harden into plaster,” Amy finished. “We saw today how well plaster sticks to things. It should stick to shoe bottoms at least as well. Then, tomorrow morning at breakfast, we’ll check everyone’s shoes, and whoever is sporting plaster in the treads will have a lot of explaining to do.”

Matt was quiet for a long moment. “Amy, you are a good detective. That’s brilliant.”

Amy beamed.

Chapter 8

Cracking the Case

THE BIG QUESTION
Why are pancakes light and fluffy?

"Breakfast!" Tess called out from the kitchen tent. "Come and get it!"

Amy fell into step beside her brother. "Okay, once we've started to eat, I'll pretend to drop something under the table, slip down there, and quickly check out the bottoms of everyone's shoes."

They sat down at the table with the others just as Tess came walking up with a huge platter of hot, **fluffy** pancakes and a bottle of maple syrup. "Good morning! This morning's breakfast is brought to you by another amazing chemical change!"

Felix eyed the pancakes hungrily. "Um, do you think you could explain that statement *while* we eat, rather than before?"

"Absolutely," Tess said, handing him the platter. "Last night after the campfire I was thinking about chemical changes that we encounter every day. Some of the most familiar ones have to do with food. When people cook or bake things, all sorts of chemical changes take place. For example, pancakes are light and fluffy thanks to a chemical change between two ingredients: baking soda and buttermilk. When these two substances are mixed together, atoms are rearranged and new types of molecules are produced. One of those new molecules is the gas carbon dioxide. Tiny bubbles of carbon dioxide gas form throughout the pancake batter and are trapped as the batter cooks and solidifies. The result is light and fluffy pancakes that are honeycombed with tiny air pockets."

Kristal peered at the pancake on her plate. "So that's why they look like they're full of little holes. I always wondered about that."

Amy took a bite of her pancake. It was wonderful and she wished she could concentrate on simply enjoying it. But she was focused on the results of another chemical change this morning, one that had hopefully left traces on someone's shoes. She waited until everyone was busy eating pancakes, and then casually let her fork slip through her fingers.

"Whoops, dropped my fork," she said easily, and ducking under the table she quickly scanned the bottoms of everyone's shoes. Her plan had worked! Amy sat up and stared at Matt as he raised his eyebrows questioningly. She thought for a moment how to communicate her discovery, and then picked up the bottle of maple syrup. "Matt, would you pass the syrup to Julian?" she said, trying to sound casual. "It looks like he needs more."

Matt's eyes widened in surprise.

Felix was already helping himself to seconds. "These pancakes are great, Tess. Too bad Dr. Forester missed them."

"She planned to be back before we headed up to the dig site," Tess replied, "so I'm guessing she and the sheriff will be here soon. I'll make more batter when they arrive."

Amy noticed that when Tess said this, Julian swallowed hard and put down his fork. He looked scared. Amy's mind raced as she tried to think of what to do next. "Since we're going to put plaster jackets on more fossils at the dig site today," she said, turning to Tess, "how about Matt and I load up the plaster of paris and the other things we'll need?"

"That would be great," Tess said, pouring herself some coffee. "I can sit here and relax."

"Actually, why don't you help us, Julian?" Amy added, as she got up from the table. "It'll go faster with three."

When Amy stepped inside the lab, she saw the shoe prints in the plaster dust on the floor. They led from the entrance to the table, where all the missing fossil fragments now lay in a neat row.

Julian stopped outside the tent entrance and then stepped inside reluctantly.

“I suspected that whoever took these fossils would bring them back,” Amy said quietly, “what with the sheriff coming and all.”

Julian looked about to deny it, but then stopped and let out a huge, unhappy sigh. “How did you know it was me?”

Amy explained about the ice, the plaster dust, and the shoes. Julian groaned and sat down heavily on a wooden crate full of tools. “I suppose you’re going to tell Dr. Forester when she gets here—and the sheriff.”

“How about you tell us why you took the fossils in the first place?” Amy said.

Julian hung his head and said, “I didn’t mean to take them, really. Everything just went wrong.” He paused and then plunged ahead. “Remember when Dr. Forester was so excited about the first set of fossils, but wanted us to wait until morning to see them? Well, I didn’t want to wait. So I snuck in here later that night to see them for myself. I’d picked one up to look at it more closely. Then I thought I heard someone coming, and without thinking, I shoved the fossil into my pocket and slipped out the back of the tent.”

“Why didn’t you just admit it the next morning when Dr. Forester found it missing, and give it back?” Matt asked. “It’s not like you meant to steal it. She would have believed you.”

“I didn’t think she would. I figured she’d be really angry, and send me home, and I didn’t want that to happen. I thought I’d just put the fossil back when no one was looking, and she’d just assume she had misplaced it. But every time I tried to do that, either Tess or Dr. Forester was here in the lab.” Julian poked at the tent floor with the tip of his shoe. “Then we found more fossils, and Dr. Forester started talking about how great it would be if she could get some of them to fit together. I thought since I had the missing piece, maybe I could use it to figure that out, and maybe it would turn out be an important new discovery, and I might be famous, and then my dad—,” Julian’s voice trailed off.

“What about your dad?” Matt asked quietly.

“Then my dad might be proud of me, like he is of my brother Jack.”

Amy and Matt exchanged a long look.

Julian hung his head again and picked at a seam on his jeans. “It was a silly idea, of course. Once I had the fossils, I couldn’t make any sense of them. I couldn’t even figure out a way to put them back in the lab without getting caught. So I put them in a sack and hid them under a bush.”

“And then Dr. Forester went off to get the sheriff, thinking we’d been robbed by fossil thieves,” Amy said.

Julian nodded. “So last night I brought the fossils back and put them there on the table. It seemed better than being caught with them red-handed or having to admit in front of everyone what I did. I didn’t think much further than that.”

No one spoke for a long moment. Julian looked from Amy to Matt and back to Amy again. “So, what are you going to do? Are you going to tell Dr. Forester I stole the fossils?”

“No, but you are,” Amy said quietly. “I think Dr. Forester will understand that it wasn’t stealing in the normal sense of the word, because your **intentions** were good.”

Julian looked doubtful, but he nodded, sighing. “You’re right. I’d feel better if I came clean, even if Dr. Forester decides to send me home.”

“I think your chances are pretty good, actually,” Matt said.

“We’ll be there to support you, too,” Amy added. “And I’ll be sure to mention that you saved me from that snake!”

Sudden shouts and the sound of a car horn interrupted her. “Dr. Forester must be back,” Amy said. “Let’s meet her together, okay?” Julian nodded and quietly followed Amy and Matt out of the tent.

Everyone gathered around the pickup. “Where’s the sheriff?” Felix asked, as Dr. Forester got out.

“He had something else he needed to do, but he’ll be here by mid-morning,” she replied. “And he did help explain the SUV we saw. It was a rancher the sheriff knows, out looking for lost cattle.”

“While we’re waiting, let’s pack up our gear,” Tess said. “We have a long day of excavating ahead.”

Amy, Matt, and Julian hung back, and the other campers followed Tess. “Dr. Forester?” Amy said, glancing quickly at Julian. “Would you mind coming into the lab with us? There’s something we need to show you.”

Dr. Forester looked quizzically from Amy to Matt and Julian and back to Amy again. “No problem,” she said. “Lead the way.”

It took Dr. Forester only a few seconds to spot the fossils all lined up on the table in the lab. “Now this is a surprise!” She picked up each fossil, examining it closely. “And they are all here, even the one that first went missing.” She crossed her arms and looked at them expectantly. “So, I assume someone is going to explain?”

Julian cleared his throat. “Yes, ma’am, I am.” In a shaky voice, he proceeded to tell Dr. Forester the whole story. Amy chimed in about the snake, and Matt added that Julian felt really bad.

When they were finished, Dr. Forester was quiet for a long time. Then she nodded, as if deciding something. “I **appreciate** your honesty, Julian. And I hope you’ve learned that you should always tell the truth right away. Things just tend to get worse if you don’t.”

Julian nodded and stared at the ground. “When do I have to leave?”

Dr. Forester put her hand on his shoulder. “It took a lot of courage to confess what you did. And I think your worrying about all this has probably been punishment enough. You’re welcome to stay.”

Julian beamed a huge smile. “That’s fantastic. This camp is the most fun I’ve ever had!” Then his smile faded. “But how are we going to explain to the others that the fossils are back?”

Dr. Forester thought for a moment and then said, “Leave that to me.”

When they all joined Tess and the others, Dr. Forester held up her hand. “There has been an unexpected turn of events,” she said, gesturing toward the lab tent. “The missing fossils have been found. Let’s just say—” she paused as a hush fell over the group—“our prime suspect is a curious ground squirrel who decided to make off with the bones rather than food.”

For a moment, everyone was silent. The silence was followed by laughter and loud conversations. Suddenly Tess’s voice rose above all the others. “What about the sheriff?”

Dr. Forester frowned. “That’s a problem. He’s going to make the long drive out here for nothing, and I’ve got no way to reach him.”

“You could call him!” Daria offered. “I know a place where you can get a cell phone signal.”

Dr. Forester looked surprised. “You do?”

“I was pretty homesick the first couple days, so I tried my phone in lots of different places. The other night I found a spot not far from camp where I got two bars!”

Dr. Forester dug her cell phone out of her pocket. “Please show me that spot, Daria, so I can call the sheriff and save him the trip.”

As they left, Amy nudged Matt and whispered, “That explains Daria’s late-night walk.”

When Dr. Forester and Daria returned, Felix arrived with his huge backpack and set it down on the table outside the kitchen tent.

“Gather around, everyone,” Felix said. “I’m disappointed we won’t get to meet a real western sheriff. But the return of the fossils calls for a celebration, and I’ve got just the thing.” He unzipped the backpack’s main compartment and started taking out candy bars and packets of beef jerky, peanuts, jelly beans, licorice, and all sorts of other yummy treats.

“Felix, what is all this?” Tess asked, staring at the growing pile of food.

“Survival rations!” he said gleefully. “I always carry this much food with me, just in case hunger strikes and the next meal is still hours away. And aren’t you all just dying for a treat?” He smiled his mischievous grin.

Matt nudged Amy. “That explains a lot.”

Amy nodded, pleased with how well things had turned out. The Case of the Missing Fossils was solved, and Julian was able to stay. Fossil Camp felt suddenly right and happy—and she had cracked the case!

The only place with a
cell phone signal :(

Chapter 9

A New Day, A New Dinosaur!

THE BIG QUESTION
Why is chemcial change the ultimate recycler?

Amy traced the entire edge of the dinosaur jawbone with the tip of her finger. She and Matt had finished excavating it, and she enjoyed the feel of the smooth, **glossy** fossil. A blazing sun hovered over the dig site, but after the success of the morning and the return of the missing fossils, for once the heat didn't bother her. Maybe she was getting used to it.

On the other side of the dig site, Tess was showing Felix and Daria how to use a rock hammer and chisel to carefully chip away the rock around several back bones they'd excavated in preparation for encasing them in a plaster jacket. Matt and Amy were next in line to learn this technique, and Amy couldn't wait to mix the plaster of paris and water. The chemical change that took place when that happened was one she'd really grown to appreciate.

Kristal was sitting on the ground, sketching Julian as he scraped away the last of the sandstone around the dinosaur foot bones that they had been working on. Amy was pleased to see that Julian was back to being his normal self. And Dr. Forester was sitting off in the shade at the far end of the plateau, happily studying the strange little bones with a magnifying glass. She'd announced that from now on, she wasn't letting them out of her sight and was even going to sleep with them next to her cot at night.

Tess stood up and tugged off her safety goggles. "I think it's already time for a water break, everyone, because the heat today is fierce." Matt retrieved bottles of cold water from the ice chest, and Amy was reminded of their first day of digging and the discussion of matter. It suddenly struck her how much chemistry they'd all learned since.

“You’re pretty sneaky, Tess,” she said with a laugh as they all sat down under the tarp at the edge of the dig site. “We came to Fossil Camp to learn about fossils, and you ended up teaching us chemistry, too.”

Tess smiled. “So you haven’t minded all my chemistry lessons?”

Amy shook her head. “It’s been really interesting, especially learning about chemical changes. I like the idea that chemical changes can turn one type of matter into another by shuffling atoms around that go on to bond in new combinations.”

“In a way, I supposed it’s a bit like recycling,” Felix said thoughtfully, staring at his water bottle. “What I mean is, when we recycle these plastic bottles, they’ll be remade into something new.”

“Actually, chemical changes are the ultimate recyclers,” Tess replied, “because they recombine the same elements over and over again in different combinations to form new types of matter. A plastic water bottle already has a long history of recycling, Felix, from a chemical change point of view. Would you like to hear the story?”

Everyone said yes, so Tess drained the last of the water from her bottle and began. “Imagine you had a time machine and you set the dial for 300 million years ago. You stepped out into a warm, humid, green world full of forests and swamps teeming with tall trees, gigantic ferns, and all sorts of other ancient plants. Plants and plant-like organisms grew in the ancient oceans, too. All of those green, growing things, like all living things today, had bodies built mostly from compounds that contain atoms of the element carbon.

“Because there was so much plant life living and growing on the earth 300 million years ago, there was also a lot of plant life dying. Some of those dead organisms decomposed relatively quickly. Some were buried and fossilized like Achy-Breaky. But some underwent different kinds of chemical changes that transformed their carbon-rich remains into the carbon-rich substances we call oil and coal.”

“So carbon atoms that were once in the bodies of ancient, green, growing things are now in oil and coal?” Julian asked.

“Not all of them, of course, but a lot of them,” Tess said. “Now zoom forward in your time machine to the 1900s, when chemists started playing around with the carbon-rich compounds in oil. They discovered chemical processes that could change some of those compounds into plastics.” She held up the empty water bottle. “In other words, carbon atoms that were once in the bodies of three-hundred-million-year-old lifeforms became part of oil deep in the ground and are now part of this plastic bottle in my hand.”

Matt whistled softly and shook his head. “That’s absolutely amazing.”

“Actually, everywhere you look in nature you see the recycling of elements thanks to chemical changes.” Tess reached over and plucked a blade of prairie grass from a nearby clump. “Like all plants, including plants that grew 300 million years ago, this grass carries out something called **photosynthesis**. That’s a process in which water and the gas carbon dioxide undergo a chemical change.”

“Carbon dioxide—that’s the same gas that makes pancakes fluffy, right?” Kristal asked.

“Yes, that’s the one,” Tess said. “In photosynthesis, the atoms making up molecules of water and carbon dioxide are recombined, using energy from sunlight, to produce molecules of sugar and oxygen gas. Plants release the oxygen into the air, and use the sugar molecules to grow and build their bodies, including the parts that animals and people eat for food.”

“So atoms of carbon, oxygen, and other elements that were once in the air or the water became part of plants, and then became part of us when we ate the plants,” Daria said.

“Exactly,” Tess said.

“But how did the carbon dioxide get into the air in the first place?” Felix asked.

“Excellent question, Felix.” Tess took a deep breath and let it out slowly. “The cells of all living things produce carbon dioxide as a waste product. We get rid of it by exhaling.” Then she gestured toward the fossils that lay in the rock beside them. “Whenever something dies, like good old Achy-Breaky, the compounds in its body are broken down and the atoms that formed them are recycled. Some chemical changes that are part of decomposition return carbon to the air as carbon dioxide.”

“You mean that when we take a breath, we’re breathing in carbon atoms from something that died?” Daria asked.

Tess burst out laughing. “Yes, I guess you are, but atoms are no different if they are in something dead or in something alive. They are just atoms.”

Tess glanced at her watch. “One last thing I’d like you to think about, and then we should get back to work. You’ve been working on Achy-Breaky for several days now. You’re getting to know him. But think about this as well: When this amazing dinosaur died, the compounds that made up his body were broken down by chemical changes. The atoms that were once part of those compounds moved on. Perhaps, thanks to chemical changes, some of Achy-Breaky’s atoms are now part of compounds in the soil or the water or the air that you are breathing.”

A hush fell over the group as they stared at Achy-Breaky’s bones, warm and shining in the bright sunlight. Amy knew she would never look at those bones in quite the same way.

Felix stood up and took a deep breath. “Thanks, Achy-Breaky,” he said. “I needed that.”

They all burst out laughing and picked up their tools to resume their work.

Before they could even get started, however, Dr. Forester came hurrying over. Her face was aglow with excitement, and she held a fossil in one hand and her magnifying glass in the other. “I found something,” she said, in a voice that made them stop everything they were doing. “I found unmistakable evidence that these strange little fossil bones are those of a small dinosaur. Come and look!”

They gathered around her as she held up one of the fossils. “The key was this piece, the one that went missing right away.” She pointed to part of the fossil fragment. “This piece is definitely from a dinosaur skull. I can tell because there are telltale ridges in the bone that are places where muscles attached in a way unique to dinosaurs.”

“What kind of dinosaur was it?” Daria asked.

“That’s the really exciting part,” Dr. Forester replied. “Based on the curve of this piece, it’s from a very small dinosaur. At first I thought it might be from a baby dinosaur or a **juvenile**. But other features that I’ve identified this morning are only found in skulls of dinosaurs that are fully grown. That means that this dinosaur was an adult.” She stopped and looked at everyone. “But I’ve never seen an adult dinosaur with a skull this small, which means we might just have discovered a new species. I’m not absolutely positive at this point, but I am certain enough to be very excited.”

“Wow, a new species!” Felix exclaimed.

“That means you could be famous, Dr. Forester,” Julian said, smiling. “You told me so on our first day here.”

“That’s where you’re wrong, Julian,” Dr. Forester said softly. “A discovery like this could mean that you’ll all be famous. Whatever we discovered, you all helped discover it, and that means you get your names on the scientific paper that we will write about this little dinosaur.”

“It’ll need a name,” Amy said, taking the small piece of bone from Dr. Forester and cradling it in her hand. “It will need a scientific name like *Acheroraptor temertyorum*,” she said, sounding out the syllables slowly.

“How about *Fossilcampus fantasticum*?” said Felix gleefully.

When they’d stopped laughing, Tess glanced at her watch again. “Okay, fossil campers, let’s get back to work. Tonight we can sit around the fire and talk all you want to about this new discovery. But don’t forget, we have a bigger dinosaur to work on, with lovely bones that need to be excavated, jacketed, and transported back to camp.”

Amy watched as everyone picked up their tools and resumed tasks that just a few days ago had seemed strange and new. They had learned so much and gained so many skills. For Amy, Fossil Camp had turned out to be far better than she had ever anticipated. Who knew that digging up fossil bones under the hot sun—in a place with snakes—would turn out to be so much fun, or that she'd discover she could use physical and chemical changes to solve a real mystery?

'*Inspector Ellis*,' she thought, '*here I come!*'

Enrichment 1

A Pioneering Chemist

Do you love science? Percy Lavon Julian certainly did, from the time he was a young boy growing up in Montgomery, Alabama. But while you were probably able to go to any school you wanted to and study any subject you were interested in, that was not true for Julian. He lived at a time in American history when those sorts of freedoms were reserved for people with white skin, and Julian's skin was not white. Despite facing enormous obstacles while growing up, during his education, and in his career, Julian overcame them all to become a pioneering chemist. Julian made important discoveries in chemistry that helped improve the lives of hundreds of thousands of people, and continue to do so.

Julian was born in Montgomery on April 11, 1899, into a society where life was hard for most African Americans. Opportunities for getting a good education or a good job were few and far between. Julian's father was relatively fortunate in that he did have a good job as a mail clerk for a railroad, and earned enough money so that his son could go to a segregated elementary school. After finishing the eighth grade, Julian wanted to continue his education. But there were no high schools in Montgomery that allowed African American students to attend.

That didn't stop Percy Julian. He went to a school for African Americans that trained its students in practical skills, including teaching. While he was training to be a teacher (for African American students only) Julian began reading some of the science books his father kept at home in his personal library. Of all the different science subjects he read about, chemistry was what really fascinated him. Julian decided that becoming a chemist was what he wanted to do more than anything else, despite the fact that there were few other African Americans working in the field of chemistry at that time in the United States. But once again, Julian didn't let that obstacle stop him. In 1916, with the help of one of his teachers, Julian was accepted into Indiana's DePauw University as a chemistry student.

When he arrived at DePauw, Julian learned two things very quickly. The first was that he was he was woefully underprepared for his college classes and would have to take special classes in order to catch up to his classmates. The second thing he learned was that not all people held the same view about African Americans as those he had known in Alabama. Julian's classmates were friendly, and one of his chemistry professors, William Blanchard, went out of his way to help Julian succeed. After Julian graduated at the top of his class in 1920, he taught for two years at Fisk University in Tennessee before entering graduate school at Harvard University, where he was admitted thanks to the strong support of his former professor and his obvious talent for chemistry.

After receiving his master's degree from Harvard, Julian became a chemistry professor himself at what is now West Virginia State University in 1926. Despite the fact that his university laboratory was not well equipped, Julian began trying to synthesize, or create in the laboratory, certain types of chemical compounds found in plants. He was inspired in his work by an Austrian chemist, Ernst Späth, who had done groundbreaking experiments in synthesizing plant compounds from medicinal plants. In a fortuitous turn of events, driven largely by Julian's talents, he ended up studying under Späth in Austria three years later and receiving his PhD from the University of Vienna in 1931. Späth, a demanding professor, commented that Julian was an extraordinary student, one of the best he had encountered in his teaching career. Julian became the third African American in history to earn such a distinguished degree.

While at the University of Vienna, Julian had worked closely with another chemist, Josef Pikl, and in 1931, the two returned to the United

States together to take up positions first at Howard University and then at DePauw. There, the two chemists began what would become a major discovery in chemistry and in medicine. They successfully synthesized a chemical compound known as physostigmine, a substance found naturally in a plant called the Calabar bean that had been used since the end of the 1800s to treat the eye disease glaucoma. Physostigmine relieves pressure in the eye, a characteristic of glaucoma that, if left untreated, can lead to blindness. By successfully synthesizing physostigmine in the laboratory, Julian and Josef made it possible for this compound to be mass produced and made available at an affordable price to people suffering from this terrible eye disease. Working on glaucoma may have had particular significance for Julian, because glaucoma is a disease that strikes large numbers of African Americans. In fact, African Americans are five times more likely to develop glaucoma than whites. Successfully producing physostigmine in the laboratory made Julian and Josef famous, and for the first time in history, made the successful treatment of glaucoma a possibility for almost everyone.

Despite his success doing chemical research at DePauw, racial discrimination was still a barrier for Julian to advance in his career. The university would not grant him the position of professor because of the color of his skin. In fact, Julian couldn't find any university in the United States that would. When he was offered a position as a research chemist at the Glidden paint company in Chicago in 1936, Julian decided the opportunity to do chemistry research there was too good to pass up. He accepted the job and began focusing on developing new products from soybeans.

Julian's career took off at Glidden, which focused on producing new types of paint products and other novel chemical compounds. He received great support in his work and had the freedom to do very creative work in his laboratory. One of the first products he developed from soybeans was lecithin, a chemical compound that is still used today to keep certain types of food fresh and to improve the smooth consistency of foods such as chocolate. Julian went on to synthesize a compound from soybeans that was such an effective fire-retardant—meaning it could help put out fires—that it was used by the United States Navy to help fight fires on ships at sea. And that was really just the beginning. Julian's research on soybeans led to the creation of compounds there were useful in paints, as coatings on paper, and as ingredients in glues and plastics. Julian's work helped make soybeans one of the most important crops grown in the country.

Julian's next major chemical discovery came about as the result of an accident at the Glidden plant. Water had unexpectedly leaked into a huge tank of soybean oil, and plant workers reported that a strange white substance had formed at the bottom of the tank as a result. Julian studied this substance in his laboratory and discovered that it was a plant hormone, a substance that helps regulate plant growth and development. Other researchers had proved that this plant hormone could be used as a starting point to synthesize a human hormone very important to human health. The discovery was another huge milestone in Julian's research career.

In the late 1940s, Julian made yet another landmark discovery. He figured out a way to synthesize a hormone called cortisone from the strange substance initially found in the bottom of the soybean oil tank. Cortisone and related chemical compounds are among the most effective drugs that doctors have available for the treatment of a terrible disease known as rheumatoid arthritis, which causes pain and swelling of the joints in people. At the time Julian made his discovery, the only source of cortisone was from animals, and it was only available in small quantities at a very high price. For instance, in order to acquire just one gram (about 0.04 ounce) of natural cortisone, nearly 170 cattle were needed. And that single gram of cortisone would have cost roughly $700, a very large sum of money in the 1940s, one that only the wealthiest people could afford.

Julian's research revealed a method for synthesizing cortisone in the laboratory for a tiny fraction of the cost of the natural hormone—about fifty cents per ounce, or two cents per gram. His discovery meant that hundreds of thousands of people suffering from arthritis would be able to find relief from their pain as a result of his laboratory research.

Things were going very well for Julian, but he was facing a growing problem. The Glidden Company's primary goal was to make better paint products. Julian's goal was to synthesize chemical compounds in the laboratory that helped people, especially people who were sick. In the early 1950s, he quit his job at Glidden and started his own company. It was a bold step, especially for someone working in a society that was still influenced by people who felt that African Americans didn't have the right to the same opportunities as white people. But Julian went right on making important discoveries with his new company, Julian Laboratories. He developed a new and improved version of cortisone and created new ways to make other chemical products better as well.

Julian Laboratories became a place where young chemists, regardless of color, were welcome to freely explore new ideas and experiment with new chemical compounds. In his early sixties, Julian decided to sell Julian Laboratories and create the Julian Research Institute, a nonprofit organization dedicated to training a new generation of young chemists.

In 1968, the American Institute of Chemists presented Julian with the Chemical Pioneer Award for his outstanding contributions to chemistry research in the United States. A few years later he was elected to the National Academy of Sciences, which is among the highest honors that any scientist can receive in this country.

Julian died in 1975, leaving behind a legacy of new chemical compounds that by now have helped relieve the pain and suffering of millions of people worldwide. His research institute helped launch the careers of many chemists who have followed in his footsteps. Throughout his life, Julian overcame prejudice and discrimination in order to follow a dream of pursuing chemistry, a dream that was sparked when he was still a young man, and one that he pursued for the rest of his life.

Enrichment 2

Abundant, Amazing Aluminum

The next time you pop the top on a soda can, take a little time to appreciate the packaging. The lightweight can that's become a universal container for all types of fizzy drinks and fruit juices is made of a remarkable element called aluminum.

On the Periodic Table of the Elements, all the elements are arranged from 1 to 118 based on their atomic number, which refers to the number of protons found in the nucleus of an atom. Aluminum is element 13, meaning that an atom of aluminum has 13 protons in its nucleus and 13 electrons spinning around that nucleus. The chemical symbol for aluminum is Al, and on a Periodic Table you'll see that the elements above and below Al are boron (B), gallium (Ga), indium (In), and thallium (Tl). Except for boron, chemists classify all of these elements as metals. Aluminum is a lightweight, silvery-white metal that is exceptionally malleable. It can be pounded into flat sheets (think aluminum foil) and molded or bent into an endless variety of shapes, from familiar soda cans to the strong, sleek wings of jumbo jets. Aluminum is also very shiny, easily drawn out into thin wires, and an excellent conductor of both electricity and heat.

With all this going for it, it is not surprising that aluminum is used for a wide variety of things that we use in everyday life. Common objects made of aluminum include window and door frames, tent poles, window screens, faucets, patio furniture, mailboxes, ladders, bike frames, golf clubs, baseball bats, and the silvery trim on many cars. In the average kitchen, you are likely to find aluminum pots, pans, and utensils, aluminum foil, and aluminum parts in many appliances. Aluminum is prized for making strong, lightweight, waterproof containers and packages for food, such as soda cans, trays for frozen dinners, bags for chips and other snacks, and wrappers for candy bars and sticks of gum.

Just as we are surrounded by aluminum products, aluminum surrounds us in nature as well. In fact, aluminum is the most abundant metal in the earth's crust. However, you won't find lumps of pure aluminum lying around like gold nuggets, because the element aluminum is never found free in nature. It exists naturally only in compounds, in which atoms of aluminum are bonded with atoms of other elements, typically oxygen and hydrogen. The most abundant source of aluminum is a type of rock called bauxite. Bauxite is found in many parts of the world, with Australia, China, Brazil, India, and Guinea having some of the largest deposits. Millions of tons of aluminum are produced every year from the processing of bauxite. In fact, essentially all of the aluminum that has ever been produced came from this very abundant type of rock.

It is because aluminum is bound up with other elements in nature that people didn't know with certainty that it existed until the early 1800s. Several chemists in different countries developed chemical processes to try to separate aluminum from other elements that combine with it in these compounds. In 1825, the Danish scientist Hans Christian Ørsted became the first person to successfully carry out such a separation and produce pure aluminum in its metallic form. However, Ørsted's process was slow and expensive, producing only tiny amounts of the element. Over the new few decades, other scientists experimented with more efficient methods for extracting aluminum from natural compounds. French chemist Henri-Étienne Sainte-Claire Deville's process made it easier to produce somewhat larger quantities of aluminum. But the element was still so rare that it was considered a precious metal, more valuable than gold. In 1855, a small bar of pure aluminum was exhibited next to the crown jewels of France at a social event in Paris called the Universal Exhibition. Displayed next to precious jewels and stunning gold jewelry fit for royalty, the little bar of aluminum caused quite a stir, and aluminum quickly became all the rage among the rich. Emperor Napoleon III had a set of aluminum tableware made, but because it was so costly, it was used only for state banquets attended by his most honored guests. French jewelers and watchmakers crafted aluminum bracelets, watches, and items such as opera glasses for wealthy clients who could afford this rare and unique new metal. As the process for producing aluminum improved over the next few years, the price fell considerably, but it was still considered rare and valuable for quite some time.

Across the Atlantic Ocean, aluminum played an interesting role in the building of the Washington Monument in Washington, D.C. Begun in 1848, the towering Washington Monument was built in the shape of an Egyptian obelisk—a tall and extremely narrow pyramid—as a memorial to honor George Washington, the nation's first president. The monument took over thirty-five years to construct, and there was considerable debate about what type of material should be used to create its pointed tip. The tip was more than ornamental; it also needed to serve as a lightning rod that would help channel electric current safely down into the ground whenever the monument was struck by lightning. Copper, brass, and several other metals were suggested for the cap, but in the end, the construction engineers decided to use aluminum. The monument's pure aluminum tip, shaped like a tiny pyramid and just 8.9 inches (22.6 centimeters) high, was cast in 1884. Its sides were polished until they gleamed like mirrors and were then inscribed with important dates in the monument's construction and the names of people who helped design, build, and fund the project. On December 6, 1884, Lieutenant Colonel Thomas Lincoln Casey of the U.S. Army Corps of Engineers placed the shining aluminum tip on top of the completed monument as crowds of people cheered more than 550 feet below. Up until that time, most Americans had never heard of aluminum, and suddenly it was crowning the country's greatest monument.

Within just two years after the Washington Monument was completed, two scientists working independently—one American and one French—figured out a way to extract aluminum quickly and relatively inexpensively from a compound called aluminum oxide. The method developed by Charles Martin Hall and Paul Louis Toussaint Héroult in 1886 came to be known as the Hall-Héroult process. In 1888 an Austrian chemist, Karl Josef Bayer, invented a process that made it possible to obtain aluminum oxide from bauxite. By using these two processes together—the Bayer process to produce aluminum oxide and the Hall-Héroult process to extract aluminum from that compound—it was suddenly possible to produce aluminum easily and quite inexpensively. The price of aluminum dropped to just a few cents a pound, and people quickly found new uses for this shiny, lightweight metal in industries and in all kinds of products. Nearly all the aluminum produced in the world today is still done using the Hall-Héroult and Bayer processes.

Mention the word *aluminum* and most people immediately think of aluminum beverage cans. They were first produced in the United States in 1959. Hundreds of billions of aluminum cans are produced worldwide every year, and they can be found in even the most remote corners of the world. Aluminum cans are lightweight, easy to stack, and exceptionally good at preserving whatever they contain without imparting any metallic taste. The cans are remarkably strong, too, able to withstand up to ninety pounds of pressure per square inch exerted by the pressurized gas inside that gives soft drinks their fizz when the cans are opened. It may seem hard to believe, but four six-packs of soda cans are also strong enough to support the weight of a vehicle weighing two tons!

For a while after aluminum cans were first introduced, they were commonly discarded as trash because they were considered disposable. Gradually people began to recognize how terribly wasteful this was, and companies figured out ways to recycle aluminum cans and other aluminum products. According to the aluminum industry in the United States, 113,000 aluminum cans are recycled every minute. Currently, it takes roughly two months for a recycled aluminum can to be turned into a new can, and the average can contains about 68 percent recycled aluminum. However, there is still plenty of room for improvement. Between 1972 and 2003, it is estimated that Americans threw over one trillion aluminum beverage cans into the trash, enough cans to circle the earth 3048 times. Recycling helps conserve energy as well as aluminum. It takes 95 percent less energy to recycle an aluminum can than it does to produce a new one with aluminum extracted from bauxite.

If you have ever had trouble pronouncing or spelling aluminum, you are not alone. Part of the problem lies in the fact that aluminum has had several different names, or at least different spellings of its name, since it was first identified as an element by the English chemist Sir Humphry Davy, in 1807. When Davy first identified this previously unknown element, he called it alumium. Apparently he wasn't satisfied with that name, however, because he changed it to aluminum sometime later. In 1812, Davy changed the name of the element yet again, this time to aluminium. The reason he did this is unclear, but it might have been because Davy had discovered and named several other elements—potassium, sodium, and magnesium—that all ended in –ium rather than –um. Perhaps Davy wanted the names of his discoveries to match.

Because Davy was English, his final *–ium* spelling of the element became the accepted one in Britain, and aluminium was properly pronounced al-you-MIN-ee-um there and in countries under British rule. In the United States, however, people tended to spell the element's name either aluminum or aluminium for several decades, until aluminum won out around the year 1900. Americans pronounced this spelling of the element's name as ah-LOO-min-um. In 1925, The American Chemical Society made the *–um* spelling official for chemists in the United States. But in 1990, the International Union of Pure and Applied Chemistry decided that the official international spelling among chemists and other scientists should be aluminium. Despite that decision, most people in the United States still spell it aluminum.

By either name, though, it is still the same amazing element.

Meet the Author

Rebecca L. Johnson

Rebecca Johnson is the author of many highly acclaimed children's books. In this interview, Rebecca shares her own experiences as a member of a fossil dig team, as well as other fascinating facts about her life as an author.

Rebecca, you once participated in a fossil dig. Can you tell us about your own experience?

I participated in a fossil dig in central South Dakota, in a location along the Missouri River. A long time ago, during the Cretaceous Period, vast areas of this part of the United States were underwater as part of a large inland sea called the Western Interior Seaway. As a result of this area having once been seabed, it is rich in fossils of ancient marine animals. Our dig began along the edge of the riverbank, and then we expanded our search inland. We were digging in exposed sediment, and it wasn't long before we began to uncover some really interesting things.

What did you find?

Well, at one site we found the fossil remains of a prehistoric type of sea turtle deeply imbedded in rock. Its shell was over twelve feet long. At another site we found the fossil skeleton of an ancient, extinct marine reptile called a mosasaur. Mosasaurs are quite fascinating. They were large powerful predators, some as big as a small whale, with very sharp teeth and paddle-like fins.

What was life at camp like?

Well, in many ways it was similar to camp life described in the story. We had daily routines. Some people cooked. Some people washed the dishes. In the evening we did research, and we sat around a campfire and talked about our day. It was a lot of fun. In fact, the menu in our camp was pretty similar to the food the children got to eat at Fossil Camp—and yes, there were lots of snacks, too!

Rebecca, how did you become an author?

When I was in the fifth grade, I loved science and art. As I progressed through middle school, high school and eventually college, I began to think about how I could incorporate my love of science and art into a career. My writing career began when I worked on science materials for textbooks. I illustrated, too. But more and more I wanted to show young people how interesting science and scientific discovery is. That's when my career as a children's author really began. I began to explore ideas and topics that I thought children would find interesting.

(Left) Working beneath the blazing sun, members of our team cover a partially excavated fossil with strips of plaster-coated fabric to create a plaster jacket. (Right) The fossil is chiseled free from the underlying rock.

Rebecca, what are your three favorite children's books?

My first choice would have to be *Alice in Wonderland*, by Lewis Carroll. I have no less than six different copies of *Alice in Wonderland*, so—old or not—it will have to go on my list of the top three books I read over and over again as a child. Second would be Madeline L'Engle's *A Wrinkle in Time*, and third would be Zilpha Keatley Synder's *The Egypt Game*. I was obsessed with everything ancient Egyptian throughout most of my grade school years. I was an odd child reader, I think, because I also read all the Sherlock Holmes stories. I loved mysteries and detective stories, and still do. And I remember very clearly that in fifth grade I read Hugo's *Les Miserables*. Despite the length and the vocabulary, I thought it was one of the best stories I had ever read and couldn't wait to return to it every day after school.

(Large photo) Exposed by wind and rain, the fossil bones of an ancient mosasaur litter the dry ground. Paleontologists use markers and simple grids made of wood and string to help record the exact position of the fossils they find. (Inset) These fossils once formed part of the mosasaur's long backbone.

Glossary

A

appreciate, ***v.*** to recognize the worth of

atom, ***n.*** the basic unit of an element

B

barren, ***adj.*** bleak and lifeless

blazing, ***adj.*** very hot

bond, ***n.*** in chemistry an attraction between atoms that allow chemical substances to be formed

boundaries, ***n.*** the limits of an area

C

cells, ***n.*** the basic building blocks of living things

chemistry, ***n.*** the science of matter

condense, ***v.*** to change from a gas to a liquid

conductor, ***n.*** a good channel for something (such as electricity, or heat)

D

decompose, ***v.*** to decay

devour, ***v.*** to eat fast and hungrily

discovery, ***n.*** the act of finding something new or unexpected

dissolve, ***v.*** to turn into a solution

E

embeded, ***v.*** fixed deeply into the surrounding mass

encased, ***v.*** completely surrounded

Eureka!***(exclamation)*** an ancient Greek word meaning, "I have found it!"

evaporate, ***v.*** to turn from a liquid into a vapor

expert, ***n.*** someone who has deep knowledge and skill in an area, usually from long experience and study

expose, ***v.*** to make something visible by uncovering it

F

fluffy, ***adj*** light texture. Filled with air

flushed, ***adj.*** with a reddish color [usually the face]

fragment, ***n.*** small part that has been broken off something

furnace, ***n.*** a very hot oven

G

genuinely, ***adv.*** honestly, authentically

gesture, ***n.*** a movement, usually of the hand or head, to express meaning or point to something.

glossy, ***adj.*** shiny and smooth

H

horizon, ***n.*** where the earth seems to meet the sky

hunch, ***n.*** a guess based on feelings, not facts

I

incredulous, ***adj.*** disbelieving

intention, ***n.*** aim or plan

J

juvenile, ***n.*** a young creature or person

L

lurch, ***v.*** to make sudden, unsteady movements

M

mammal, ***n.*** a type of animal. [Humans are mammals.]

mass, ***n.*** the amount of matter in a substance or object

matter, ***n.*** any substance that occupies space and has mass

mixture, ***n.*** two or more substances which are combined without changing their chemical composition

molecule, ***n.*** a group of atoms bonded together

mutter, ***v.*** to say something in a low or hard-to-hear voice, often with annoyance

N

nudge, ***v.*** to gently touch or push

P

paleontology, ***n.*** the science of fossils

Periodic Table, ***n.*** a way of organizing chemical elements

photosynthesis, ***n.*** process by which plants use sunlight to make food from water and carbon dioxide

plateau, ***n.*** an area of high, level [no slope] ground

portable, ***adj.*** easy to carry

precisely, ***adv.*** exactly; with complete accuracy

prod, ***v.*** to poke someone or something

pry, ***v.*** to use force to open

R

reluctant, ***adj.*** unwilling

resonance, ***n.*** a quality of sound: clear, deep, long lasting

S

sandwiched, ***v.*** to be squashed between two things

shimmer, ***v.*** to shine with a light that seems to move a little

slather, ***v.*** to spread on thickly

slithering, ***v.*** sliding along

sliver, ***n.*** thin, narrow piece

spangled, ***v.*** covered with small, shiny objects

suspicious, ***adj.*** giving the impression of dishonest behavior

T

tarnishing, ***v.*** a process by which some metals become dull

technique, ***n.*** a way of doing something, usually with some skill

tense, ***adj.*** nervous, tightly wound

trace, ***n.*** a slight mark

W

weaving, ***v.*** moving back and forth

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TEXAS
ELEMENTARY LITERACY PROGRAM

Grade 5 | **Unit 8** | Reader

The Badlands Sleuth: The Case of the Missing Fossils

880L

ISBN 9781643837796

Grade 5

Unit 8: *Chemical Matters: Detectives, Dinosaurs, and Discovery*

Use the Interactive Read-Aloud lesson and text on the following page to kick off this unit with your students.

Unit-level Essential Question

How do chemical changes affect your everyday life?

Lessons 1–5

Guiding Question: What does all matter have in common?

Writing Prompt: If the particles in gases are very far apart and full of energy, what might the particles in solids be like?

Lessons 6–10

Guiding Question: How can chemistry be used to solve problems?

Writing Prompt: If you were going to catch the fossil thief, what plan involving chemical reactions would you make?

Lessons 11–15

Guiding Question: What are some everyday chemical changes?

Writing Prompt: How are chemical changes similar to and different from recycling?

Unit 8 Culminating Activity

Amy and her friends learn a lot about everyday chemical reactions, like ice melting and pancakes bubbling. For one week, observe the world around you and keep a journal about what chemical reactions you see in day to day life, then report back with your findings!

GRADE 5 UNIT 8

Read-Aloud

Use the following Read-Aloud to introduce **Grade 5 Unit 8**.

Tell students that throughout this unit, they will think about the following **Essential Question:** How do chemical changes affect your everyday life?

Explain that in this unit, students will be reading about a group of youngsters who attend camp in the Badlands, an area in North and South Dakota with many dinosaur fossils. While at camp, these kids learn about science, including chemistry, and they learn how chemistry can help them solve both everyday and unusual problems. Before they start the unit, though, they need to learn a bit about chemical and physical changes.

Read the Read-Aloud, pausing after each section to discuss the text-based questions.

Everyday Chemistry

by Elizabeth Wade

If you're like most people, you probably do not think very often about chemistry—or at least you probably don't realize you do. But in actuality, chemistry is all around us! Have you ever baked cookies or roasted marshmallows over a campfire? You may not have known it, but those cookies and that campfire were both chemical changes at work!

All matter can be transformed by physical and chemical changes, which result in the extraordinary diversity of our physical world. But there is a big difference between these kinds of changes. Have you ever watched a popsicle melt on a hot summer day or noticed that a neighborhood pond has frozen over during the frigid winter? Those are examples of physical changes, not chemical ones.

Here's the difference: in a physical change, the form or appearance of a thing changes, but the substance (or chemical composition) of the thing does not change. That means that ice, water, and steam all have the same chemical composition, even though they take different physical forms. But when you mix and bake ingredients like eggs, flour, and vanilla, the result is a whole new thing: cookies! That's because chemical changes took place.

Literal. What is the difference between a chemical and a physical change?

» Chemical changes require a change in the substance of a thing. Physical changes do not require this.

Literal. Which kind of change is a popsicle melting?

» physical

Inferential. Would boiling an egg be a chemical or physical change?

» chemical

Physical and chemical changes happen throughout everyday life, often without us even realizing it. But sometimes they are very important to our well-being. For example, in 1914, a famous British explorer named Ernest Shackelton decided to do something no one had ever done before: cross the entire continent of Antarctica. Shackelton had experience in exploring, as he had been very close to the South Pole previously. But crossing Antarctica was a bold, ambitious undertaking—and even Shackelton did not succeed. He and his men were shipwrecked and had to abandon their plans; no one crossed Antarctica for another forty years!

Shackelton kept a detailed account of his journey, though, and in it he records how important he and his men found it to create—or sometimes prevent—certain chemical and physical changes along the journey. This was especially important after their ship sank, because the men did something very daring: they decided to camp on large of ice floating through the ocean. The men spent several months living carefully on these chunks of ice!

Shackelton's journals described these events, noting just how important it was to be aware of the physical changes of melting ice. On one hand, the men did not want the ice beneath them to melt, because it was the very thing that kept them from sinking! Shackelton writes:

"The thaw consequent upon these high temperatures was having a disastrous effect upon the surface of our camp. The surface is awful!—not slushy, but elusive. You step out gingerly. All is well for a few paces, then your foot suddenly sinks a couple of feet until it comes to a hard layer. You wade along in this way step by step, like a mudlark… hoping gradually to regain the surface. Soon you do, only to repeat the exasperating performance… What actually happens is that the warm air melts the surface sufficiently to cause drops of water to trickle down slightly, where, on meeting colder layers of snow, they freeze again, forming a honeycomb of icy nodules instead of the soft, powdery, granular snow that we are accustomed to."

Clearly the men did not like this kind of physical change! On the other hand, sometimes they did want to create this very change—they just wanted it to happen somewhere other than the ice beneath them. Because Shackelton and his men were in the middle of the ocean, they were surrounded by water, but they did not have access to any drinking water. The only way for them to get fresh water to drink was by melting parts of the ice. They also lacked enough fuel for warming things, so they developed innovative ways of creating the physical change of melting ice into water. Shackelton describes how they did it: "As fuel is so scarce we have had to resort to melting ice for drinking-water in tins against our bodies."

Literal. What were Shackelton and his men trying to do?

» cross the continent of Antarctica

Literal. What happened to disrupt their journey?

» They had a shipwreck.

Inferential. Why did the men want some physical changes to happen but not others?

» They wanted the ice in their tins to melt so that they could have drinking water. They did not want the ice under their feet to melt, because they did not want to fall into the ocean.

While on their journey, the men also witnessed chemical changes. The most significant chemical change was rust, which happens when metal oxidizes. The possibility of rust worried the men, because if their tools grew rusty and unusable, they would be in big trouble. During their time on the ice, the men saw many ships that had wrecked and deteriorated; Shackelton recalled seeing " iron-bound timbers with the iron almost rusted through." Though the men had their own hardships, seeing these wrecks made them feel lucky they had not become one of the "many tragedies" other explorers had suffered.

As they continued their journey, the men did their best to keep their tools in good condition. Shackelton described how, after a long day of fishing, the men would return to camp, where "rusty needles were rubbed bright on the rocks and clothes were mended and darned." Although they were in dire circumstances and did not know how they would survive, Shackelton and his men were still surrounded by the same kind of physical and chemical changes that we experience every day. And their knowledge of those changes helped Shackelton get through the arduous experience and return to South Georgia Island, the place where his journey started.

Throughout this unit, you'll learn more about these changes, their impact, and how people use their knowledge of these changes to shape their environment, bake better cookies, and even solve crimes! Let's just hope you're never stranded on the ice like Shackelton!

Literal. What kind of chemical change did the men see?

» metal rusting

Inferential. Why did the men feel lucky, despite all the trouble they faced?

» Their ship had sunk, but they had escaped.

Literal. Why was it important for the men to keep their tools from rusting?

» They needed to use them, and they could not use or replace them if they rusted.

Inferential. The passage says that the men "were in dire circumstances." Based on the rest of the passage, what do you think this means?

» The men were in a very dangerous situation.

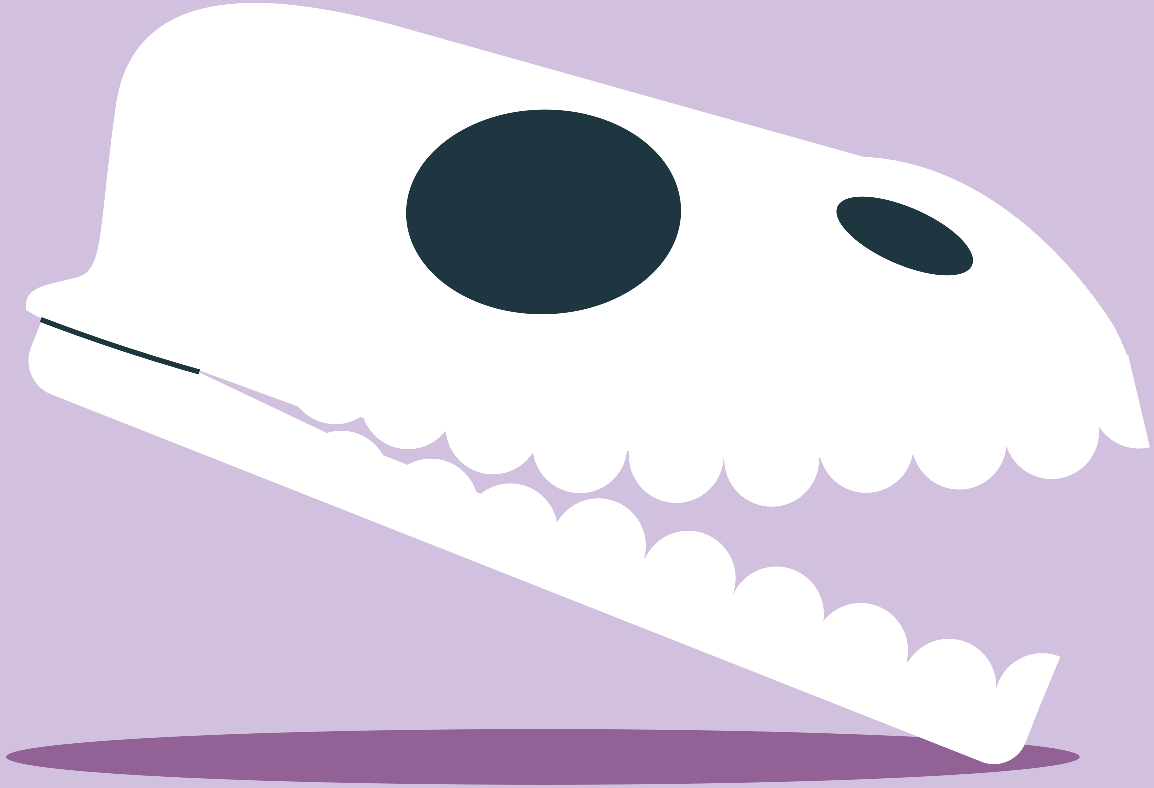
Use the following prompts to extend student understanding of the Read-Aloud.

Guiding Question: How are physical and chemical changes different?

Writing Prompt: Where or when have you seen a physical or chemical change take place?

Amplify.
TEXAS
ELEMENTARY LITERACY PROGRAM

ENGLISH



Grade 5

Unit 8 | Digital Components

Chemical Matter: Detectives, Dinosaurs, and Discovery

Grade 5 | Unit 8

Chemical Matter:
Detectives, Dinosaurs, and Discovery

Digital Components

Contents

Chemical Matter:
Detectives, Dinosaurs, and Discovery

Digital Components

Scientific Definition

Palaios
(Ancient)

Ontos
(Ancient)

Logia
(Study, theory)

→ **Paleontology**

Scientific Definition

Tyrannos
(Tyrant, absolute ruler)

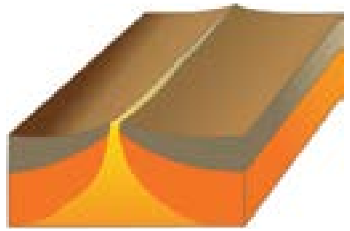
Sauros
(Lizard)

Rex
(King)

→ **Tyrannosaurus Rex**

Geology: The Changing Earth

A Matter of Time

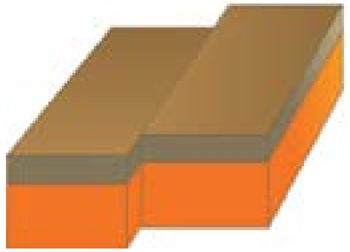


Tectonic plates move apart.

At some boundaries, tectonic plates are moving apart. As the plates separate, molten rock flows up from the mantle into the space between them, creating new crust. Mid-ocean ridges are an example of this type of plate interaction. Tectonic plates along the mid-ocean ridge in the Atlantic Ocean are moving apart at a rate of about 0.8 to 2 inches per year. That may not seem like much, but it adds up. Two hundred million years ago, the landmasses of North America and Europe were joined. So were South America and Africa. Thanks to separating plates, these continents now lie on opposite sides of a vast ocean.

Tectonic plates colide.

At other plate boundaries, tectonic plates are colliding, or crashing together. In some places, colliding plates slowly crash into each other. The crust at their edges gradually crumples and is pushed higher and higher, creating mountains. In other places, one of the colliding plates slides under the other. Two plates are colliding this way along the western coast of South America. A heavier oceanic plate is sliding under a lighter continental plate. Scientists call this process subduction. Subduction has created a deep ocean trench off the coast of Chile and Peru. It has also had a role in creating the towering Andes Mountains along the western edge of South America. Similar plate interactions have formed mountain ranges throughout Earth's long history.



Tectonic plates slide sideways past one another.

Finally, tectonic plates slide sideways past one another. It's never a smooth process. Plate edges press together hard. They often get stuck while the pressure keeps building. Eventually the pressure gets too great. The stuck edges break free, causing the plates to jerk past each other.

Providing the Answers

The theory of plate tectonics answered many questions in geology. It explained how Wegener's Pangaea broke apart. It explained how the continents have been slowly rearranged over millions of years. The movement of the plates also explained mid-ocean ridges, deep ocean trenches, patterns in the locations of mountains, and many other features on Earth's surface. The theory has become the cornerstone of modern geology.

As plates move, interesting things happen. Most of the time, they happen incredibly slowly. Sometimes, though, the effects of plate movements are sudden and dramatic. Think earthquakes and volcanoes!

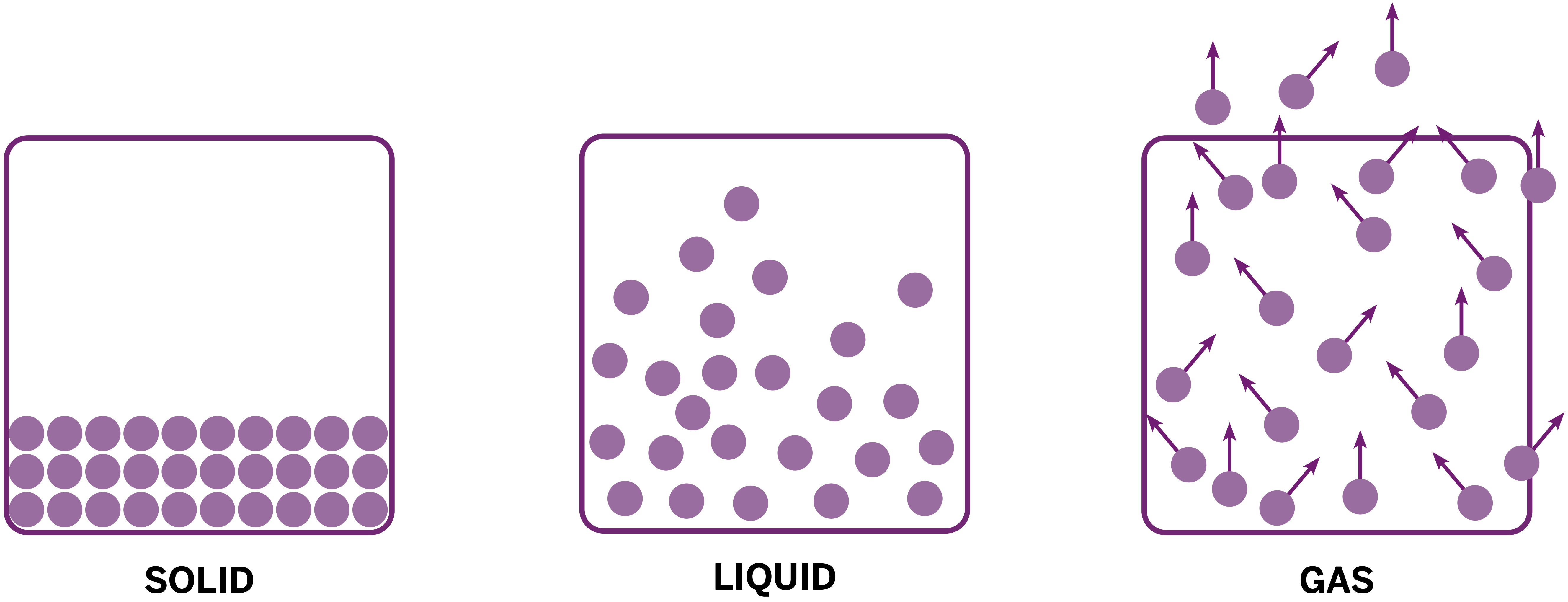
Core Conclusions

You may never have heard of the Danish scientist Inge Lehmann. Among seismologists, however, she is famous. Around 1900, scientists thought the earth had just three layers: an outer crust, a solid mantle, and a liquid core. Lehmann studied seismograph records of earthquakes. She analyzed how seismic waves changed as they traveled through Earth's interior. Lehmann collected thousands of records organized in boxes—there were no computers back then! She saw patterns in how seismic waves behaved as they moved through Earth. Lehmann concluded that Earth's core has two parts: a liquid outer core and a solid inner core. In 1936, she announced her findings and changed our view of Earth!

Suffix Poster

- A **suffix** is a syllable or syllables placed at the end of a root word to change the word's meaning.
- **Nouns** are words that name people, places, or things (including ideas).
- **Verbs** are words that describe an action.

Changes in State Diagrams



Sample Character Maps

Character Map 1

Character Traits and Observations

- makes friends easily
- loves chemistry and palentology

Says and Does

- drives to camp with Tess and Amy
- excavates dinosaur with Amy

Matt

Relationship with Other Characters

- Amy's brother
- talked Amy into going to Fossil Camp

Motivations/Wants

- wants to go to Fossil Camp
- wants to make an important discovery

Sample Character Maps

Character Map 2

	What He Says or Does	What We Learn About His 'Wants'	What We Learn About His Character	What Else We Learn
Chapter 1	• drives to fossil camp • arrives at camp and joins everyone in lab	• wants to be at fossil camp • wants to make an important discovery	• makes friends easily • doesnt mind heat/ bugs dirt	• Amy's brother • he talked Amy and parents into going to fossil camp • thinks camp is "cool"
Chapter 2	• excavates jawbone with Amy • does dishes later that evening			• asks "excellent question" about chemistry
Chapter 3				

Sample Character Maps

Character Map 3

Matt

- makes friends easily
- doesn't mind heat/bugs/dirt

Tess

- asks "excellent" question

Amy (Matt's sister)

- persuades to go to fossil camp
- excavates dinosaur with

Fossil Camp

- thinks "cool"
- does the dishes

Felix

- shares tent with

Julian

- both want to make important discovery
- shares tent with

Sample Character Maps

Character Map 4

Matt

Matt is Amy’s brother. He persuaded Amy to go to fossil camp and his parents to allow them to go. He hopes to make an important discovery. He makes friends easily and doesn’t mind heat, dirt, or bugs. He thinks the camp is “cool.” He has a “glow of excitement” about going to the dig site.

At the dig site, Matt excavates a jawbone with Amy. When they take a break, he asks “excellent” questions of Tess about states of matter. Later that night he does the dishes.

Tess's Rules for Observation

When I started studying chemistry, the first thing I had to learn was how to notice things properly. My rules for observation are:

1. Look carefully at everything.
2. Record what you can: mass, color, texture, state.
3. Look at how things change. If you heat it up, what happens? If you add another substance, what happens?
4. Ask, "Does what I observe match the theory?" Great scientific discoveries happen when scientists notice things not behaving the way they thought those things would. Do you see anything strange?
5. If you have a theory, test it across as many examples as you can. The more evidence you have to back up your ideas, the better.

Inspector Ellis's Rules for Detection

There's a reason I'm Amy's favorite detective. I am brilliant. No case goes unsolved if Inspector Ellis is called in (well, there was that one case with the umbrella and the penguin, but I don't like to talk about it).

Obviously, you can't become as brilliant as I am (Did I mention I was brilliant?) overnight. But you can start down the long, lonely path of becoming a great detective by following my rules of observation.

1. Look at everything. Write down what you see.
2. Collect what you can and analyze it—fingerprints, lipstick stains, everything (you can send it to the chemistry people in the lab).
3. If you've seen the crime scene before, compare what you see now with what you saw before.
4. Does anything seem out of place or unusual?
5. Interview everyone. Do their stories match up? Does anything seem out of place?
6. Is anyone behaving strangely? You can't arrest someone for being nervous, but it might give you an idea of what to look for and where.
7. Do you have a theory? Can you test it? For example, in my last case, I thought it was possible the thief had stolen out through an air vent. I tested if this was possible by sending my sidekick through the vent. I was wrong, and my sidekick became stuck, but I'd never have known this without testing my theory! (He quit later; some people can't cope with the challenge of this job.)

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 113, 115, 117, and 118 have been reported but not fully authenticated						

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Practice Sentences for Combining and Reducing

Combining

1. **(a)** The badlands were dry. Dust puffed up where they walked.

   (b) The badlands were dry and dust puffed up where they walked.

2. **(a)** Amy didn’t like sleeping by the door. Snakes were nearby.

   (b) Amy didn’t like sleeping by the door because snakes were nearby.

Practice Sentences for Combining and Reducing

Reducing

1. **(a)** Amy, who was bored, wandered over to the rock, which was striped, and stared at it.

   (b) Amy was bored and wandered over to stare at the striped rock.

2. **(a)** Amy liked books that involved mysteries more than romance, or science, or any other kind of genre.

   (b) Amy's favorite books involved mysteries.

Sample Police Report

Sample 1

Incident type: reported robbery

Address: 433 Smith Street

Witnesses: Mrs. Elena Baria

Evidence: fingerprints (on counter)

This morning at 10 a.m. there was a reported robbery on the corner of Smith and Jones Streets. Mrs. Baria, aged 53, called the police after seeing a man run out of the grocery store.

I arrived at the scene at 11:15 a.m. and spoke with Mrs. Baria. She told me:

1. There was glass all over the street when she turned the corner from the grocery store window. (I checked this and there was glass on the pavement.)
2. She saw a man who "looked suspicious" and was running fast out of the grocery store.
3. She could not describe the height or appearance of the suspect. She thought he was wearing a mask, but she could not be sure at that distance.

There was no CCTV footage of the event. We have found fingerprints on the counter of the grocery store. Further analysis is needed to determine if the fingerprints belong to the shopkeeper and his assistant or another.

The shopkeeper, Mr. Thompson, was not present, but we interviewed him later that day. He claimed that yesterday a large amount of money had been stolen. He also reported that his assistant was the only other person who was aware of the money. We have not been able to contact or locate the assistant and will continue to try.

Mr. Thompson reported that on the previous day:

1. He and his assistant arrived at the store with the money at 3 p.m. His assistant went into the back to compile inventory.
2. Mr. Thompson, at this time, put the money into the safe.
3. At 3:30 p.m. he and his assistant worked as usual in the store until 5:30 p.m. His assistant then left for the day.
4. Mr. Thompson left the store at 7 p.m. and went straight home. He locked the store as usual. His assistant does not have a key, he says.

Sample Police Report

Sample 2

Date: 1/1/2015
Day: Monday
Time: 11:15 a.m.
Officer on Duty: Inspector Ravitz
Location: 42 Hubbard Avenue
Nature of report: police information

This officer was on duty and patrolling when he was alerted by radio to a missing person report in the nearby area. He drove straight to the named house, arriving at 11:15 a.m. There he met Melissa Mulan, who had filed the report and was worried about the disappearance of her boyfriend, Jesus. Melissa is 28 and works full time in retail, and has been with her boyfriend for two and a half years. He was last seen the previous evening and had been due to arrive at her apartment that morning and then go on a picnic.

I asked for their movements the previous day. Melissa had met her boyfriend for dinner with her parents at 7 p.m. the previous evening at the Italian restaurant Da Loca. They had dinner, and Melissa accompanied her parents back to their home. She stayed for one cup of coffee. Jesus, she believes, would have returned to his apartment. She said he sometimes picks up documents from work late to carry on working at home.

Initially Mulan told me she could think of no reason for his non-appearance this morning. On further conversation, however, it emerged that they had a serious argument the night before. It also emerged that on previous occasions her boyfriend had taken a day or two to “cool off” after an argument.

I will check with Jesus’s closest friends and family and then advise waiting several hours before further investigation.

Articles on Investigations

Article 1

What is the investigation process?

(The Metropolitan Police—the police force of London)

1. **Initial investigation—**This will involve a review of witnesses, scenes, and all other available evidence.

2. **Investigative assessment—**After the initial investigation, a decision will be made whether to transfer the crime to an investigating officer for further investigation or not. This assessment will take into account the following:

   - Seriousness of the offence
   - Likelihood of solvability (for example, availability of evidence)
   - Level of resources required proportionate to the seriousness of the offence

   There are two possible outcomes at this point:

   a) Investigation will be closed.

   b) Crime will be transferred for further investigation.

Articles on Investigations

Article 1 (continued)

3. **Further investigation—**If the crime is transferred for further investigation, this will include:

- Taking statements from the victim and any witnesses
- Arresting and detaining any identified suspects and formally interviewing them at a police station
- At the end of the investigation there are three possible outcomes for the suspect(s).

  a) **Charged—**The suspect is told that he or she will be sent to court and what law he or she is alleged to have broken.

  b) **Cautioned—**An official warning is given in some circumstances.

  c) **No further action—**If there is insufficient evidence to charge or caution a suspect, no further action will be taken.

Articles on Investigations

Article 2

Preventing crime better than catching offenders

(telegraph.co.uk/news/politics/10025018/Preventing-crime-better-than-catching-offenders-sayschief-inspector.html)

Published: 29 April 2013

Tom Windsor, the chief inspector of constabulary for England and Wales, suggested police forces would get "more bang for their buck" if they focus on prevention rather than cure . . .

Mr Windsor . . . said the "primary purpose" of police is crime prevention.

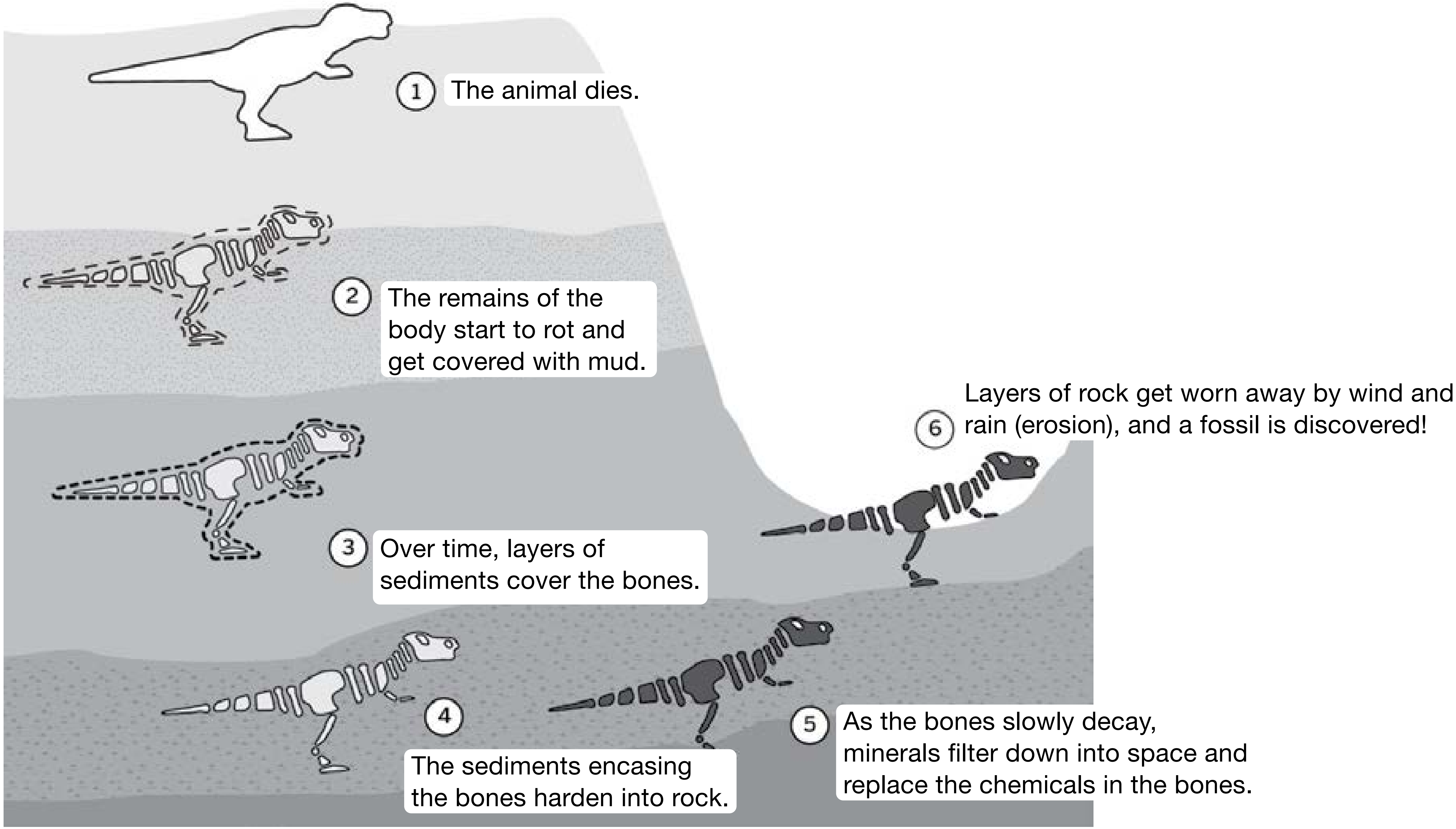
"Sir Robert Peel, who founded the modern police service in 1829 said the primary test of police efficiency is the absence of crime and disorder," he said.

"If we can prevent offences taking place and we prevent there being any victims, which is absolutely critical, and also if we save all of those costs."

Roots Poster

Roots	
A root is the main element of a word that forms the base of its meaning. A prefix or suffix added to the root can change the meaning.	

How Fossils Are Formed



Presentation Rubric

	Characters Being Presented: Name Of Student:	Characters Being Presented: Name Of Student:	Characters Being Presented: Name Of Student:
Was the group speaking clearly and maintaining eye contact?	**Yes / No**	**Yes / No**	**Yes / No**
Did they introduce the character clearly, using information from the text?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:
Did they identify objective information about the character?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:
Did they use that evidence to explain whether the character was a likely suspect?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:
Did they identify subjective information about the character?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:
Was it clear what the presenter would like to find out next about the character?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:
Did this link to their evidence?	**Yes / No** Details:	**Yes / No** Details:	**Yes / No** Details:

Physical and Chemical Changes

	Physical Changes	Chemical Changes
Chemical Composition	Chemical composition remains the same.	Chemical composition changes.
Physical Properties	Physical properties of matter (mass, color, etc.) remain the same.	Physical properties of matter change.
Heat or Light?	You don’t usually get heat or light as a result of changes in state.	Often heat or light is given off.
Reversible?	reversible	not reversible

Rules on Commas

You should place commas:

- after an introductory element (before the subject of the sentence)
- after the word *yes* or *no* when the sentence begins with that word
- before the use of a question when that question is at the end of the sentence (a tag question)

Word Choices and Fill in the Blanks

Word Choices	Sentence
mislaid, admitted, omitted, dismissed	Amy was ready to write down the final clue when she realized she had _______________ her notebook!
missile, remit, mission, permission	Amy's _______________ was clear: to find the culprit.
emitted, omitted, committed, permitted	The police officer _______________ the message across the radio to the Sheriff.
submitted, dismissed, committed, mislaid	Matt _______________ Amy's suggestion with a shrug.

Roots Poster

Roots	
A root is the main element of a word that forms the base of its meaning. A prefix or suffix added to the root can change the meaning.	

How to Help Identify the Guilty Party!

Motive: Did the suspect have a reason to want to steal the fossils? What evidence do we have for that?

Example: *Someone who loses money because of a robbery probably does not have a motive.*

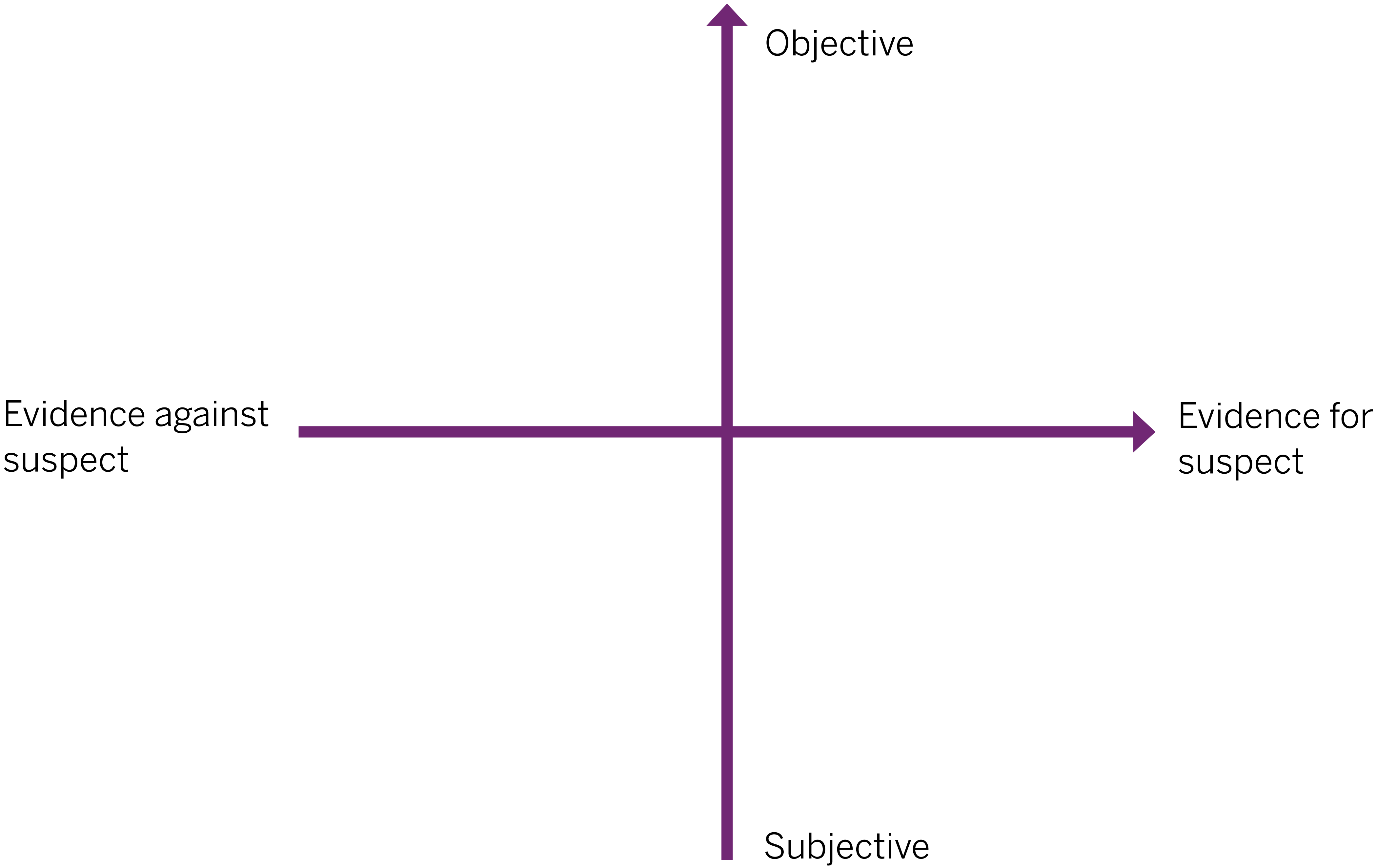
Means: Did the suspect have the practical ability to steal the fossils?

Example: *A little old lady probably did not have the strength to wrestle someone to the ground.*

Opportunity: Did the suspect have a chance to steal the fossils without being observed?

Example: *If someone was in a casino all night, and lots of people saw him or her there, he or she probably did not have the opportunity to steal something many miles away.*

Organization for Evidence Board



Evidence Boards

Evidence Boards

	Name of suspect accused: Students in small group:
Was the group speaking clearly and maintaining eye contact?	Yes / No
Did they clearly state who they were accusing?	Yes / No
Did they identify a clear motive, using evidence from the text?	Yes / No Details:
Did they identify a clear motive, using evidence from the text?	Yes / No Details:
Did they explain how the suspect had the opportunity to commit the crime, using evidence from the text?	Yes / No Details:
Was it clear when evidence was subjective and when it was objective?	Yes / No Details:
Do you think the evidence was convincing? Why or why not?	Yes / No Details:

Perfect Tense Verbs

1. Past Perfect

An action that was completed in the past before something else happened:

“I had lunch before I went to the cinema.”

2. Future Perfect

An action that will have been completed at some point in the future:

“I will have solved four more cases by June.”

3. Present Perfect

Includes:

An action that was begun in the past and continues in the present:

“I have already run three miles!”

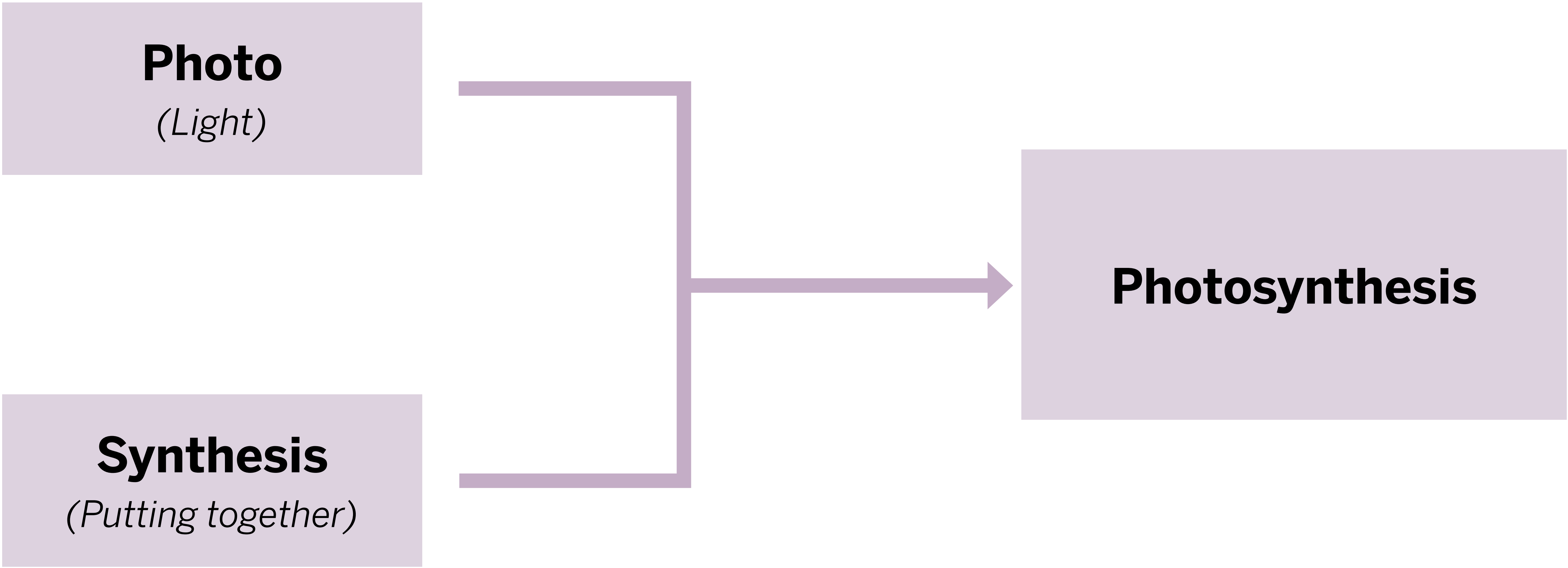
An action done several times in the past and continued in the present:

“I have played the piano since I was four.”

On the board/chart paper write the following sentences:

“The police had interviewed the suspect before they cracked the case.”
“Yesterday when I arrived home I realized that someone had broken in!”
“Amy was disappointed at the bookstore because she had read all the detective novels.”

Scientific Definition



Scientific Definition

Photo
(Light)

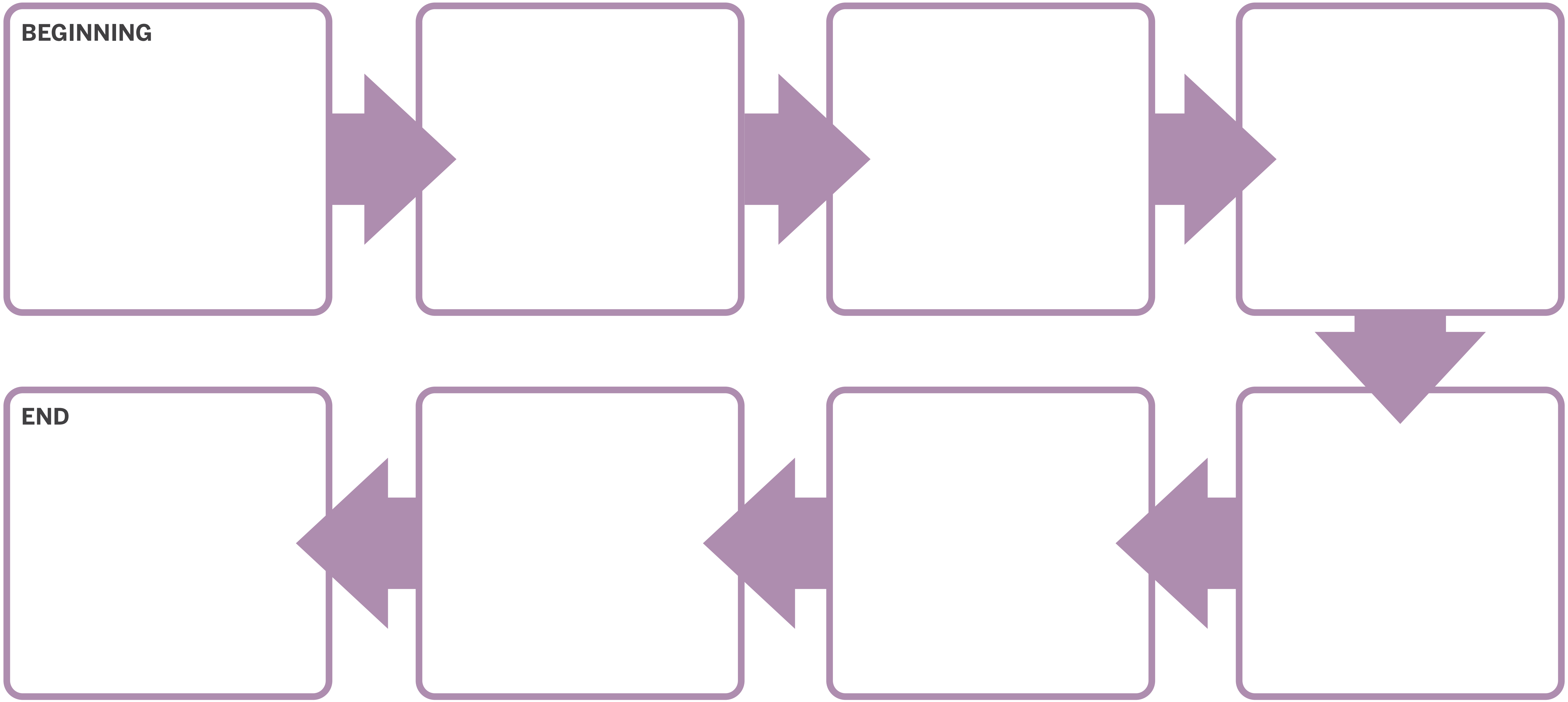
Graphos
(Writing/writer)

?

“My Story” Details Chart

	Details	Description—words I plan to use
Setting	a space station in the year 3030	alien, crowded, diverse
Characters	Amy, a young chemical detective	intrepid
My characters’ “wants”	Amy wants to figure out why she’s there. The chief scientist on the space station wants to be famous. The apprentice wants to be noticed by the chief scientist.	
How will my story begin?	Amy wakes up to find herself in a pod, with no memory of how she got there.	
How will my story end?	Amy proves the space station is an elaborate hoax!	
The plot (sequence of events)	(see plot diagram)	
What scientific content might I use?	Amy shows that the “scientists” who brought her there were using incorrect science: they must be actors!	

Plot Diagram



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Welcome!

Grade 5, Unit 8

Chemical Matter: Detectives, Dinosaurs, and Discovery

In this unit, students will be introduced to the concepts of matter, physical and chemical changes, and elements and compounds.

What's the story?

Students will explore how **matter** can be **transformed by physical and chemical changes**, resulting in the extraordinary diversity of our physical world. The unit is written as a **detective story** rather than as a standard informational text, combining literary and informational characteristics into a single text.

What will my student learn?

Students will learn concepts about **matter and its different states**. They will also learn about **physical and chemical reactions and changes**, **elements**, and **compounds**. These concepts are introduced gradually through the context of the protagonist's experiences, teaching students **practical examples** of these ideas.

Students will look beyond their Reader to **additional sources** to better understand the concepts introduced. They will also have the opportunity to integrate skills learned, such as how to **read and analyze** informational and literary texts, how to use information to **explain concepts and ideas**, and how to **write for different audiences and purposes**.

Conversation starters

Ask your student questions about the unit to promote discussion and continued learning:

1. What are the three states of water? What can cause water to change in state?
   Follow up: What does all matter have in common?
2. Why are all compounds molecules, but all molecules are not compounds?
   Follow up: Can you give me some examples of compounds? What about molecules?
3. You have learned that matter can move between different states. How does that help you understand fossil creation?
   Follow up: What are the different physical properties of a fossil?
4. What is a mixture? What is a solution? And a compound?
   Follow up: Can you give me an example of each? What do they have in common? What is different about them?
5. What is the difference between a physical and a chemical reaction?
   Follow up: How do they impact chemical composition? How do they impact the physical properties of matter? What about heat or light? Are physical and chemical changes reversible?

Name: ______________________________ Date: ____________________

Amplify. TEXAS ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 1 - What is the setting of the story in Chapter 1 of the Reader? What information did the author share about Amy's environment?

Name: ______________________________ Date: ____________________

Amplify. TEXAS ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 2 - Identify a clue from Chapter 2 of the Reader that describes how Amy feels uncomfortably hot. Is this a literary or an informational detail of the text? Explain your response.

Name: ______________________ Date: ______________

Grade 5

Unit 8, Lesson 3 - What does all matter have in common? What two factors does Tess say decide whether matter is in a solid, a liquid, or a gas state? Use evidence from the text to support your response.

Name: ______________________ Date: ______________

Grade 5

Unit 8, Lesson 4 - Name and describe at least three characteristics of metals that you read in the chapter.

Name: ______________________________ Date: ____________________

Amplify. TEXAS ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 5 - After hearing the debate, do you believe the sheriff should investigate the missing fossil or not? Use evidence from the text to support your response.

Name: ______________________________ Date: ____________________

Amplify. TEXAS ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 6 - What new information did you learn about Julian and Kristal? What did you add to your character map?

Name: ______________________________ Date: ____________________

Grade 5

Unit 8, Lesson 7 - Using evidence from the chapter, explain how a mixture is different from a solution or a compound.

Name: ______________________________ Date: ____________________

Grade 5

Unit 8, Lesson 8 - After reading the first part of Chapter 6 in the Reader, who are the two new suspects? What new information did you add to your character map?

Name: ______________________________ Date: ____________________

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Grade 5

Unit 8, Lesson 9 - Imagine that you left some water in a glass outside on a hot day. When you went to fetch it, half of the water was gone. Is that a physical or a chemical change? Explain your answer.

Name: ______________________________ Date: ____________________

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ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 10 - In your opinion, what piece of evidence from the first part of Chapter 7 in the Reader is the strongest? What makes it so strong?

Name: ______________________________ Date: ____________________

Amplify. TEXAS ELEMENTARY LITERACY PROGRAM

Grade 5

Unit 8, Lesson 11 - Who did you identify as the culprit? What evidence did you use to identify this suspect as guilty?

Name: ______________________________ Date: ____________________

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Grade 5

Unit 8, Lesson 12 - Which of the four characters (Daria, Felix, the squirrels, or the SUV) had "wants" that might have led them to take the fossils? Explain your opinion using evidence from the text.

Name: ______________________________ Date: ____________________

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Grade 5

Unit 8, Lesson 13 - Explain how recycling is a chemical process. Use evidence from the text to support your answer.

Name: ______________________________ Date: ____________________

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Grade 5

Unit 8, Lesson 14 - What is the plot of your new detective story with Amy? What scientific content will you include?

Vocabulary

Grade 5 Unit 8: Chemical Matter: Detectives, Dinosaurs, and Discovery

Synonyms and Antonyms

Introduction: Synonyms and Antonyms

A **synonym** is a word that means the same thing as another word. An **antonym** is a word that means the opposite.

Let’s look at this word from our unit on chemical matter:

reluctantly

Let’s read this sentence from the unit:

Julian stopped outside the tent entrance and then stepped inside **reluctantly**.

Reluctantly means unwillingly.

Let’s think of some synonyms for **reluctantly**. Remember, synonyms are words that mean the same thing.

hesitantly

cautiously

timidly

Now let’s think of some antonyms for **reluctantly**. Antonyms are words that mean the opposite.

enthusiastically

eagerly

willingly

Let’s Try It Together!

Look at this word from our unit on chemical matter:

portable

Portable means easy to carry.

Read this sentence from the unit:

Our **portable** refrigerator can chill water down by removing heat and turn it back into ice.

Turn to a partner and whisper a synonym for the word **portable**. A synonym is a word that means the same thing.

Hold up one finger if you think **digital** is a synonym for **portable**.

Hold up two fingers if you think **moveable** is a synonym for **portable**.

Now turn to your partner and whisper an antonym for the word **portable**. An antonym is a word that means the opposite.

Hold up one finger if you think **mobile** is an antonym for **portable**.

Hold up two fingers if you think **immobile** is an antonym for **portable**.

Did you remember the steps?

1. Confirm the meaning of the word.

2. Choose a synonym, or a word that means the same thing.

   moveable

3. Choose an antonym, or a word that means the opposite.

   immobile

Now Try One by Yourself!

Read this sentence:

She fitted and wrapped the mushroom cap with plaster-soaked strips until the fossil was completely **encased**.

Encased means completely surrounded.

Write a synonym for encased. Label it with an S.

Write an antonym for encased. Label it with an A.

Answer

synonym: **covered**

antonym: **exposed**