

GRADE 8
Science

Administered May 2017

RELEASED

STAAR GRADE 8 SCIENCE REFERENCE MATERIALS



FORMULAS

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$D = \frac{m}{V}$$

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$s = \frac{d}{t}$$

$$\text{Net force} = (\text{mass})(\text{acceleration})$$

$$F = ma$$

$$\text{Work} = (\text{force})(\text{distance})$$

$$W = Fd$$

STAAR GRADE 8 SCIENCE REFERENCE MATERIALS

PERIODIC TABLE OF THE ELEMENTS

1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9	10	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A							
1 H 1.008 Hydrogen	2 He 4.003 Helium	3 Li 6.941 Lithium	4 Be 9.012 Beryllium	5 B 10.812 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.180 Neon	11 Na 22.990 Sodium	12 Mg 24.305 Magnesium	13 Al 26.982 Aluminum	14 Si 28.086 Silicon	15 P 30.974 Phosphorus	16 S 32.066 Sulfur	17 Cl 35.453 Chlorine	18 Ar 39.948 Argon							
19 K 39.098 Potassium	20 Ca 40.078 Calcium	21 Sc 44.956 Scandium	22 Ti 47.867 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.845 Iron	27 Co 58.933 Cobalt	28 Ni 58.693 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.64 Germanium	33 As 74.922 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton							
37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.96 Molybdenum	43 Tc (98) Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.906 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.868 Silver	48 Cd 112.412 Cadmium	49 In 114.818 Indium	50 Sn 118.711 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.904 Iodine	54 Xe 131.294 Xenon							
55 Cs 132.905 Cesium	56 Ba 137.328 Barium	57 Lu 174.967 Lutetium	58 Hf 178.49 Hafnium	59 Ta 180.948 Tantalum	60 W 183.84 Tungsten	61 Re 186.207 Rhenium	62 Os 190.23 Osmium	63 Pt 195.085 Platinum	64 Au 196.967 Gold	65 Hg 200.59 Mercury	66 Tl 204.383 Thallium	67 Pb 207.2 Lead	68 Bi 208.980 Bismuth	69 Po (209) Polonium	70 At (210) Astatine	71 Rn (222) Radon								
87 Fr (223) Francium	88 Ra (226) Radium	89 Ac (227) Actinium	90 Th 232.038 Thorium	91 Pa 231.036 Protactinium	92 U 238.029 Uranium	93 Np (237) Neptunium	94 Pu (244) Plutonium	95 Am (243) Americium	96 Cm (247) Curium	97 Bk (247) Berkelium	98 Cf (251) Californium	99 Es (252) Einsteinium	100 Fm (257) Fermium	101 Md (258) Mendelevium	102 No (259) Nobelium	103 Lr (262) Lawrencium	104 Rf (267) Rutherfordium	105 Db (268) Dubnium	106 Sg (271) Seaborgium	107 Bh (272) Bohrium	108 Hs (270) Hassium	109 Mt (276) Meitnerium	110 Ds (281) Darmstadtium	111 Rg (280) Roentgenium

Mass numbers in parentheses are those of the most stable or most common isotope.

57 La 138.905 Lanthanum	58 Ce 140.116 Cerium	59 Pr 140.908 Praseodymium	60 Nd 144.242 Neodymium	61 Pm (145) Promethium	62 Sm 150.36 Samarium	63 Eu 151.964 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.925 Terbium	66 Dy 162.500 Dysprosium	67 Ho 164.930 Holmium	68 Er 167.259 Erbium	69 Tm 168.934 Thulium	70 Yb 173.055 Ytterbium
89 Ac (227) Actinium	90 Th 232.038 Thorium	91 Pa 231.036 Protactinium	92 U 238.029 Uranium	93 Np (237) Neptunium	94 Pu (244) Plutonium	95 Am (243) Americium	96 Cm (247) Curium	97 Bk (247) Berkelium	98 Cf (251) Californium	99 Es (252) Einsteinium	100 Fm (257) Fermium	101 Md (258) Mendelevium	102 No (259) Nobelium

Lanthanide Series

Actinide Series

SCIENCE

DIRECTIONS

Read each question carefully. For a multiple-choice question, determine the best answer to the question from the four answer choices provided. For a griddable question, determine the best answer to the question. Then fill in the answer on your answer document.

- 1 A cook heats a meal in a microwave oven. What energy transformations occur between the microwave oven and the meal?
- A Electrical energy \longrightarrow light energy \longrightarrow chemical energy
 - B Chemical energy \longrightarrow thermal energy \longrightarrow light energy
 - C Electrical energy \longrightarrow electromagnetic energy \longrightarrow thermal energy
 - D Chemical energy \longrightarrow electromagnetic energy \longrightarrow chemical energy

2 Students were asked to identify the location of elements in the periodic table based on clues printed on game cards.

Element I

- Shiny black solid
- Metalloid
- 3 valence electrons
- 2 energy levels

Element III

- Colorless gas
- Nonmetal
- 8 valence electrons
- 5 energy levels

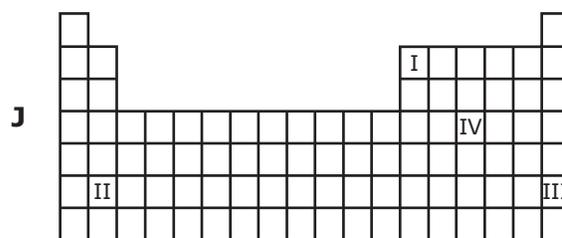
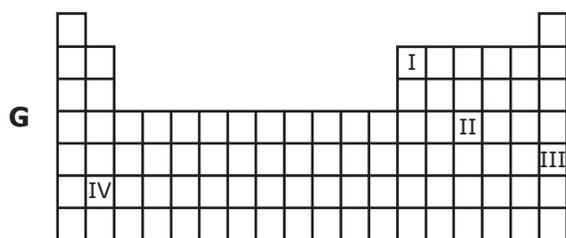
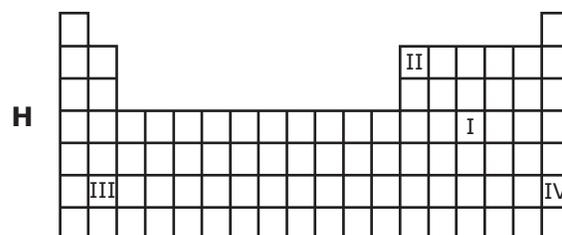
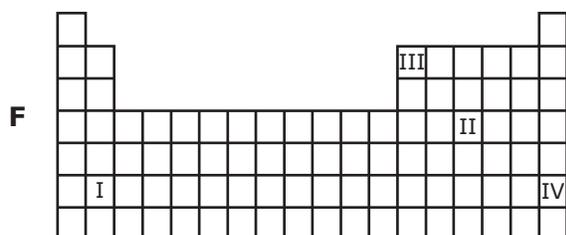
Element II

- Steel-gray solid
- Brittle metalloid
- 5 valence electrons
- 4 energy levels

Element IV

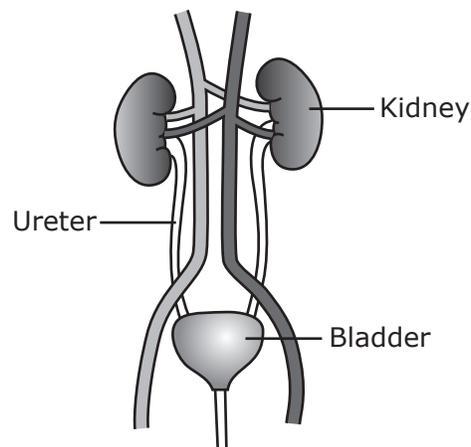
- Silvery-white solid
- Soft metal
- 2 valence electrons
- 6 energy levels

Based on the data, which periodic table shows the correct location of the four elements?



- 3** Rift valleys can form when fractures in Earth's crust widen. The valley walls slowly move at a rate of only a few millimeters a year. Which of these best describes the type of tectonic activity that forms rift valleys?
- A** Rift valleys form where a continental plate moves under an oceanic plate.
 - B** Rift valleys form where a plate slides horizontally past another plate.
 - C** Rift valleys form where two plates move away from each other.
 - D** Rift valleys form where an oceanic plate moves under another oceanic plate.
-

- 4** Part of a human body system is pictured.



The main function of this system is to —

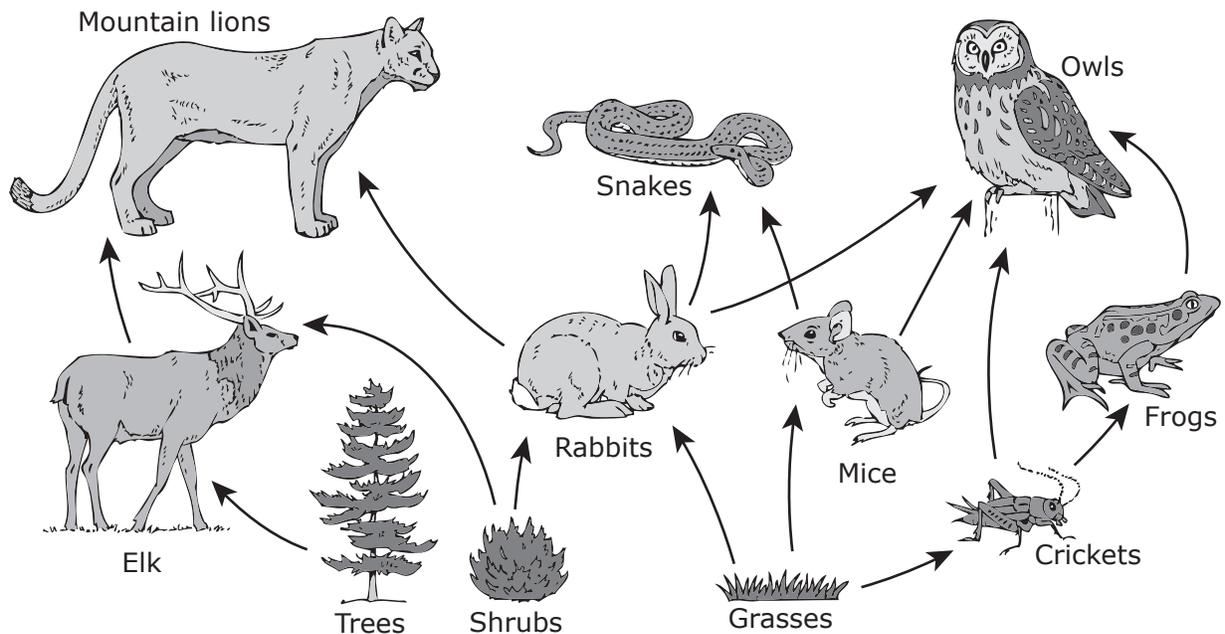
- F** control reproduction
- G** transport oxygen
- H** produce hormones
- J** remove waste

- 5 A student learns that the sun is classified as a medium-size star and that many stars are much bigger and brighter. However, the student observes that other stars look very dim, even through a telescope.

Why do other stars look much dimmer than the sun?

- A The sun appears yellow, which is more visible than other colors.
- B The sun is much closer to Earth than other stars are.
- C Other stars are made up of different gases than the sun is.
- D As light from other stars travels through space, it gets reflected.

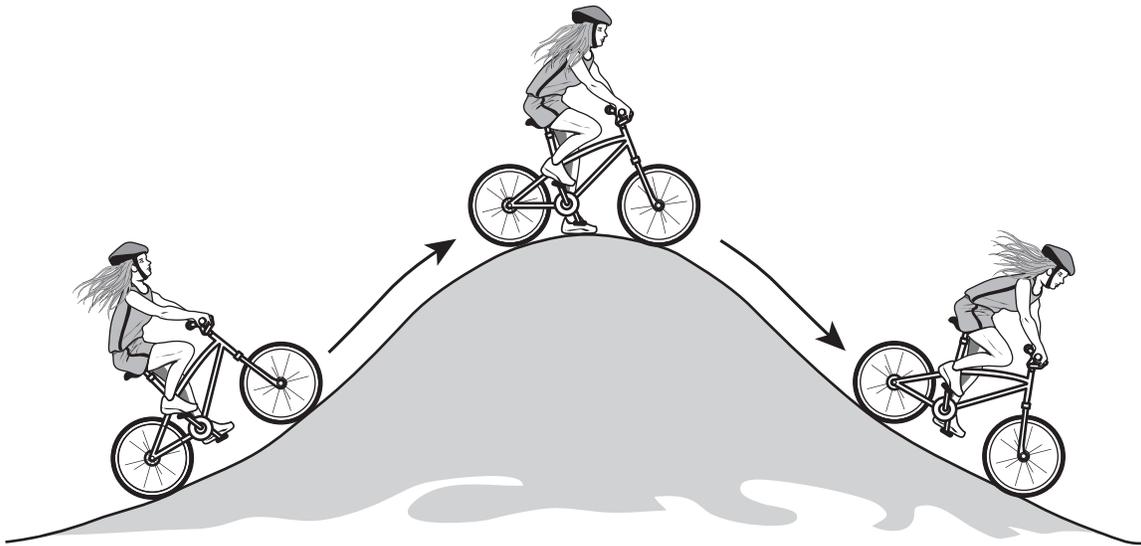
- 6 A partial mountain forest food web is shown.



Which statement does NOT describe a relationship shown in the food web?

- F Elk are prey for mountain lions.
- G Mice are herbivores that consume grasses and are preyed on by snakes.
- H Owls prey on rabbits and frogs.
- J Rabbits consume shrubs and are parasites of grasses.

- 7 A bicycle rider is traveling up a hill. When the rider reaches the top of the hill, she stops to rest. Then she travels down the hill. The diagram shows the rider in the three different positions.



Which of these correctly describes the potential energy and the kinetic energy of the bicycle rider?

- A When the rider is at the top of the hill, her potential energy is the greatest, and her kinetic energy is the least.
- B As the rider moves up the hill, her kinetic energy increases, and her potential energy decreases.
- C When the rider goes down the hill, her potential energy increases, and her kinetic energy decreases.
- D As the rider reaches the bottom of the hill, her kinetic energy and her potential energy decrease.

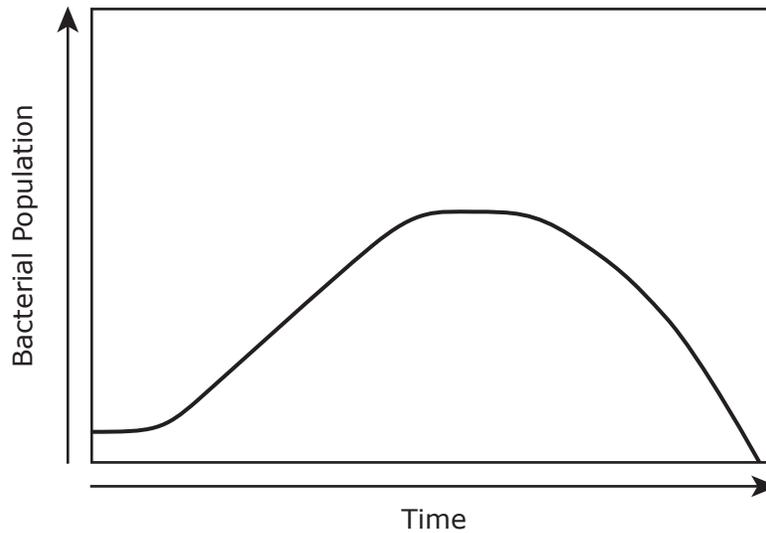
8 The diagram below shows four consecutive moon phases.



Which of the following diagrams shows the next four moon phases in the correct order?



- 9 A scientist added bacteria and a nutrient medium that could support the growth of the bacteria to a sterilized petri dish. No other materials were added. The graph models growth of the bacteria over time.



Which of these most likely explains why the bacterial population stopped growing?

- A The bacteria competed for nutrients and died after all the nutrients were consumed.
- B The bacteria did not reproduce in the system, and eventually each individual died at the end of its life cycle.
- C The bacteria mutated from photosynthetic to carnivorous organisms and consumed one another until all the individuals were dead.
- D The bacteria became diseased and were unable to survive in the closed system.

10 Which statement correctly describes the location and charge of the electrons in an atom?

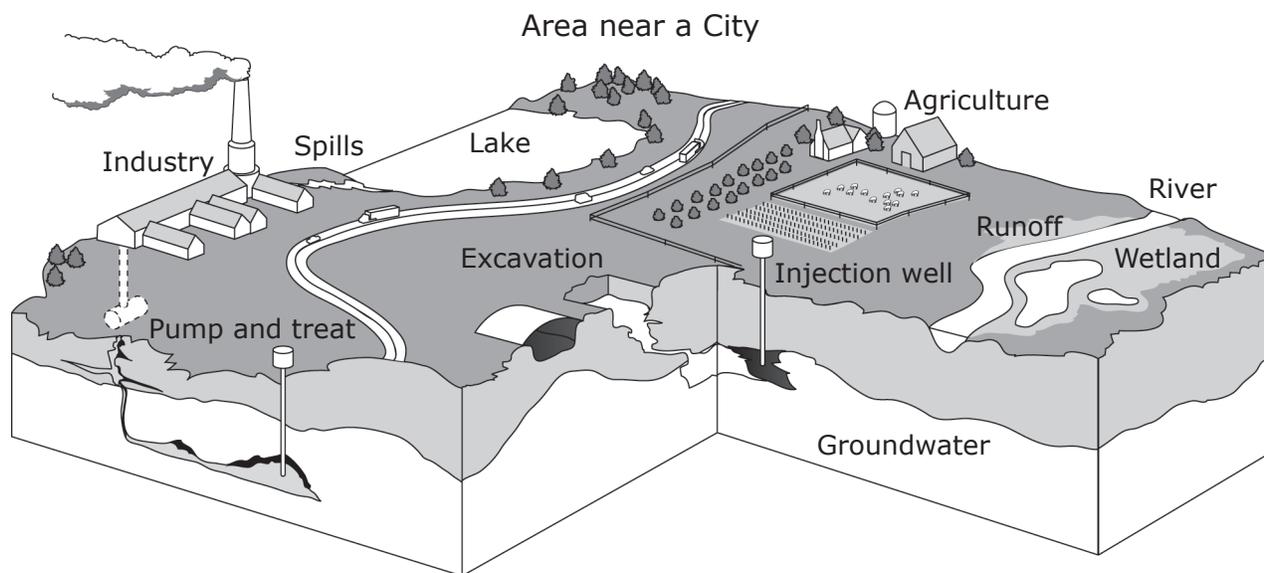
- F The electrons are inside the nucleus and have no charge.
- G The electrons are outside the nucleus and have no charge.
- H The electrons are inside the nucleus and have a negative charge.
- J The electrons are outside the nucleus and have a negative charge.

- 11** An archer shot a 0.06 kg arrow at a target. The arrow accelerated at $5,000 \text{ m/s}^2$ to reach a speed of 50.0 m/s as it left the bow.

During this acceleration, what was the net force on the arrow to the nearest newton?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

- 12** A student's model of an area near a city depicts many activities that affect the quality of the water in the area.



How does the agricultural activity most likely affect the surface water of the area?

- F** Excess crop fertilizer is carried by runoff into the river, causing excess growth of water plants.
- G** Excess crop material accumulates on the riverbanks, slowing the movement of the river water.
- H** Crops reduce erosion, increasing the amount of soil entering the river.
- J** Crops absorb pure water from soil, causing the remaining water to contain more salt.

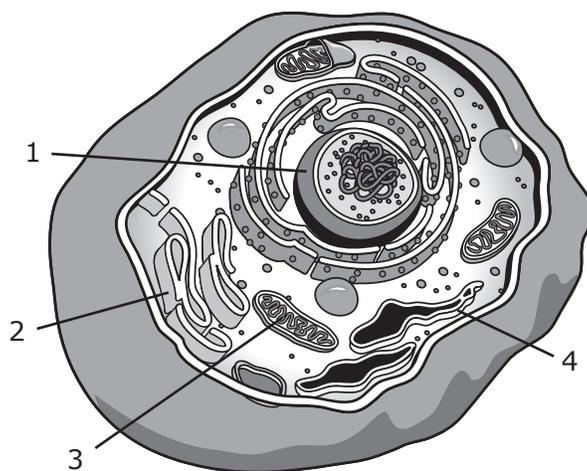
13 The table lists some compounds found in foods and their formulas.

Compound	Formula
Glutamine	$C_5H_{10}N_2O_3$
Lactose	$C_{12}H_{22}O_{11}$
Fructose	$C_6H_{12}O_6$
Sorbitol	$C_6H_{14}O_6$

Based on this information, which of these statements is NOT true?

- A A molecule of sorbitol contains three more oxygen atoms than a molecule of glutamine does.
- B A molecule of lactose contains twice as many atoms as a molecule of fructose does.
- C A molecule of fructose contains four more atoms than a molecule of glutamine does.
- D A molecule of lactose contains twice as many carbon atoms as a molecule of sorbitol does.

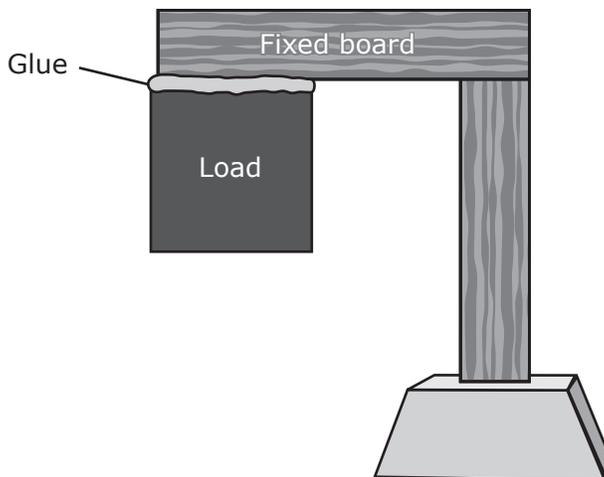
14 The diagram below shows parts of a cell.



Which organelle stores the information that determines an individual's blood type?

- F Organelle 1
- G Organelle 2
- H Organelle 3
- J Organelle 4

- 15** The unusual strength of a glue makes it able to hold a heavy object, or load, as shown in the diagram below.



If the load exerts a strong downward force, the glue —

- A** destroys the force
 - B** exerts a stronger downward force
 - C** causes the load to accelerate upward
 - D** exerts an upward force that is equal to the downward force
-
- 16** In November 2013 an object orbiting the sun seemed to disappear behind the sun. When a satellite did not detect the object, astronomers thought that the object had been destroyed when it passed close to the sun. However, when another satellite detected a small, bright object with a fan-shaped tail, astronomers proposed that the object was not destroyed.

What type of object were astronomers most likely observing?

- F** A comet
- G** An asteroid
- H** A meteor
- J** A nebula

- 17** A few years ago the population of male blue moon butterflies on the island of Samoa declined. One hypothesis for the decline of the male butterflies is that a parasite infected the cells of female butterflies. The parasite was passed to offspring through the females' eggs and killed the male butterfly embryos. At one point during the decline, nearly all the butterflies in the population were females, but after five years the number of males in the population increased significantly.

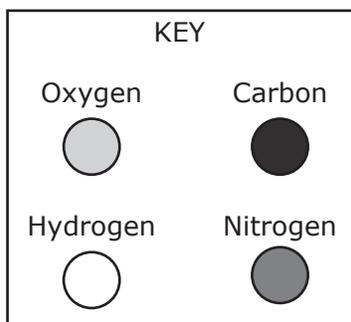
Blue Moon Butterfly



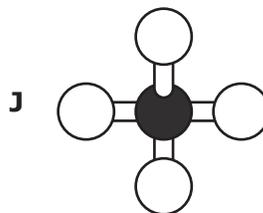
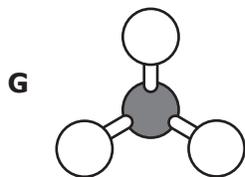
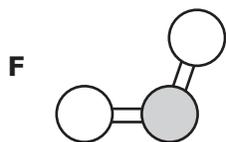
Which explanation most likely accounts for the increase in the number of male butterflies in the five years after the initial parasite problem?

- A** Male butterflies in the population that survived were able to prey on the parasites living in the females' egg cells.
- B** Female butterflies in the population that survived had a genetic adaptation that allowed them to transform into male butterflies.
- C** Male butterflies in the population that survived had a gene that made them resistant to the parasite, and they passed the gene on to their offspring.
- D** Female butterflies in the population that survived were able to protect the male eggs from the parasite and provide extra care for the male offspring.

- 18** Students in a science class made ball-and-stick models of the substances they were studying. The key shows the elements the students used in their models.



Which model represents an organic compound?

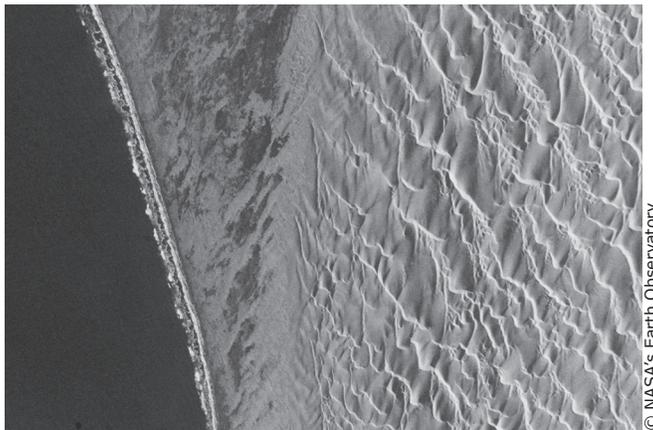


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- 19** DDT is a pesticide that was once widely used to control agricultural pests and mosquitoes. However, this pesticide caused the eggshells of certain birds, including the brown pelican, to become fragile and thin. The adults would then accidentally crush the eggs while trying to incubate them.

What happened to brown pelican populations as a result of DDT use by humans?

- A** The populations increased much more slowly.
- B** The populations decreased as fewer eggs survived long enough to hatch.
- C** The populations remained stable over time.
- D** The populations increased as pelicans laid more eggs so that more offspring would survive.

- 20** The satellite image below shows a portion of the Namib Desert in Africa. This is an ancient, sandy desert with dunes that can be up to 305 m tall. The Namib Desert extends inland from the Atlantic Ocean between 80 km and 200 km and receives only 5 mm to 76 mm of rain each year.



A satellite picture of this same area taken weeks before shows that the shape and location of some sand dunes have changed. Which of these most likely caused the changes in the dunes?

- F** Ocean waves
- G** Flowing rivers
- H** Blowing wind
- J** Crustal uplift

21 A student listed how different parts of the body work to aid in the digestion of food.

Part of Body	Action
Mouth	Teeth tear and crush food into small pieces so that food can be swallowed.
Mouth	Saliva is mixed with food to make food particles softer and easier to swallow.
Stomach	Hydrochloric acid and enzymes help break down food molecules into smaller molecules.

Which of the following is a chemical change that occurs to the food?

- A The reduction in size of food particles as food is chewed
- B The movement of food to the stomach after food is swallowed
- C The breakdown of molecules of food by enzymes and acid in the stomach
- D None of the above

22 A meteor moving 468 km per minute traveling in a south-to-north direction passed near Earth in 2013. Because the meteor was only 45 m wide and was 27,700 km above Earth's surface, it was not visible without the aid of a telescope.

Which statement describes the meteor's motion?

- F Its velocity was 7.8 km/s northward.
- G Its acceleration was 468 km/s².
- H Its speed was 468 km/s northward.
- J Its acceleration was 7.8 km/s².

23 A chemist made the table below to record some atomic properties of four elements.

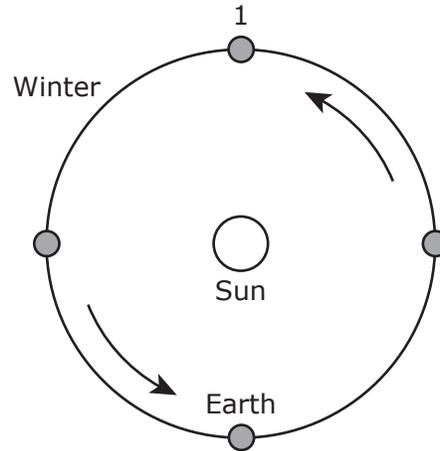
Properties of Elements

Element	Number of Protons	Number of Neutrons	Total Number of Electrons	Number of Electrons in Outer Shell
B	5	5	5	3
F	9	10	9	7
Si	14	14	14	4
Ga	31	39	31	3

Based on the information in the table, which conclusion about the chemical reactivity of these elements is valid?

- A Boron is the most reactive because it has the most protons.
- B Fluorine is the most reactive because it has 7 electrons in the outer shell.
- C Silicon is the most reactive because it has an equal number of protons and neutrons.
- D Gallium is the most reactive because it has many more neutrons than protons.

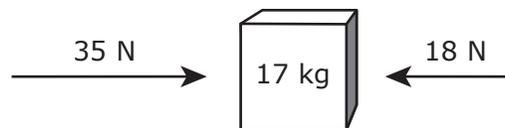
- 24 Students in a science class in Marfa, Texas, made a poster with a diagram to represent a seasonal change in the Northern Hemisphere.



Which statement best describes conditions for Earth at Position 1 in the diagram?

- F There are an equal number of hours of daylight and nighttime in the Northern Hemisphere, and the North Pole is tilted away from the sun.
- G The Northern Hemisphere has the fewest hours of daylight, and Earth's axis does not tilt at this position.
- H There are an equal number of hours of daylight and nighttime in the Northern Hemisphere because Earth's axis is not tilted in this position.
- J The Northern Hemisphere has the fewest hours of daylight, and the North Pole is tilted away from the sun.

-
- 25 Two forces are applied to a 17 kg box, as shown. The box is on a smooth surface.



Which statement best describes the acceleration of the box?

- A The box accelerates at 1.0 m/s^2 to the right because the net force is 17 N to the right.
- B The box accelerates at 1.9 m/s^2 to the right because the greater force is to the right.
- C The box accelerates at 3.0 m/s^2 because the combined forces cause the box to accelerate.
- D The box does not accelerate, because neither force is large enough to move the box.

- 26** A silver ring reacts with compounds containing sulfur in the air to form silver sulfide, a black substance that makes up the tarnish on the surface of silver objects. To remove the tarnish from the ring, students placed it in a pan lined with aluminum foil and added hot water. Baking soda was added to the hot water and stirred. Students made observations about the process.

Which observation of this process provides evidence of a chemical reaction?

- F** Hot water heated the aluminum foil.
- G** The liquid solution changed color.
- H** The pan was lined with aluminum foil.
- J** The hot water cooled.

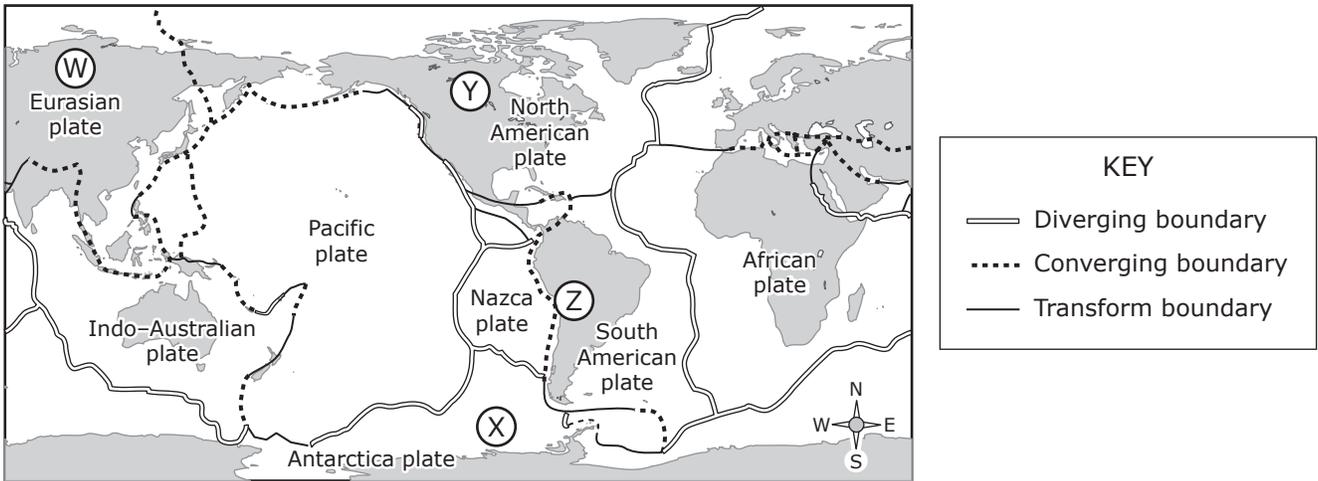
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- 27** Students in a science class visited four local ecosystems. The students observed the species present in each ecosystem and recorded their observations in the table.

Ecosystem	Observations
1: Grassy lawn on school property	The grass is mowed often and kept short. Two sparrows foraged for food in the grass. No other animals were observed.
2: Small pond with cattails growing around the edge	Two types of fish were seen in the pond. Tadpoles were swimming in the shallow areas. Large wading birds were seen feeding on tadpoles and crayfish.
3: Agricultural field	Wheat plants are the only plants growing in the field. There were many insects. No predators were observed except for a single circling hawk.
4: Wooded area along a stream	Fish, frogs, crayfish, insect larvae, and turtles were seen in the stream, and wading birds were eating small fish. Raccoon tracks were seen in the mud. Deer were moving through the trees. Many birds were seen feeding in the canopy of the woods.

Based on these observations, which ecosystem is likely to be the least sustainable?

- A** Ecosystem 1, because it has the fewest species
- B** Ecosystem 2, because it includes both aquatic and terrestrial species
- C** Ecosystem 3, because it has few predators
- D** Ecosystem 4, because it supports many animals

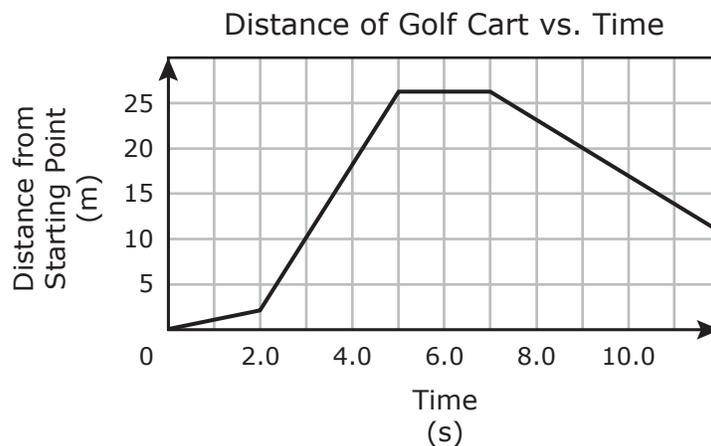
28 The map shows some of Earth's plate tectonic boundaries.



Based on the map, volcanic activity would most likely be found at —

- F** Location W
- G** Location X
- H** Location Y
- J** Location Z

- 29** A golfer collected data on the distance a golf cart traveled in a straight line and plotted it on a graph.



Which of these does NOT describe the cart's motion on this graph?

- A** The cart moved 24 m away from the starting point between 2 s and 5 s.
 - B** The cart moved toward the starting point at a speed of 3 m/s between 7 s and 12 s.
 - C** The cart moved 11 m toward the starting point between 8 s and 10 s.
 - D** The cart moved away from the starting point at a speed of 1 m/s for 2 s.
-
- 30** Which pair of properties describes the elements in Group 18?
- F** They are chemically stable and liquid at room temperature.
 - G** They have eight valence electrons and are flammable.
 - H** They are magnetic and boil at low temperatures.
 - J** They are gaseous at room temperature and chemically stable.

31 Two friends want to go for a night hike when there is a full moon in July.

July						
Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

If there is a third-quarter moon on July 2, what is the approximate date of the next full moon?

- A** July 9
- B** July 16
- C** July 23
- D** July 30

32 What is the total number of protons, neutrons, and electrons in a cadmium, Cd, atom that has a mass number of 112?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

- 33** Which of the following is most likely to cause a change in the genetic traits in an isolated population of a ground-dwelling lizard species?
- A** The exposure of an individual lizard in the population to radiation that causes a mutation that is not passed on to its offspring
 - B** An unusually dry summer in the lizard population's ecosystem
 - C** The introduction of an invasive predator that preys on the brightest-colored individuals in the lizard population
 - D** A fast-moving wildfire that burns the canopy of the trees in the lizard population's ecosystem
-

- 34** A student kicks a soccer ball three times. Another student records the distance, the amount of time the ball travels, and the average speed in the table shown below.

Soccer Ball Data

Kick	Distance (m)	Time (s)	Average Speed (m/s)
1	55	5.0	11
2	50	5.0	10
3	30	?	15

How many seconds did it take for the ball to travel 30 m during Kick 3?

- F** 0.5 s
- G** 1.0 s
- H** 1.5 s
- J** 2.0 s

- 35** A coastal area that once supported a thriving fishing industry is overfished. The number of species found living in the marine ecosystem decreases.

Which of these activities is most likely to increase the natural biodiversity in the area?

- A** Building artificial reefs and limiting fishing activity
- B** Introducing non-native species to fill unoccupied habitats and banning fishing
- C** Building artificial reefs and increasing fishing activity
- D** Eliminating non-native species and encouraging fishing for large predatory fish

-
- 36** A manufacturer selected a metal to use in producing a lightweight button for clothing. A metal that has a density of 2.71 g/cm^3 was selected.

Metal Data

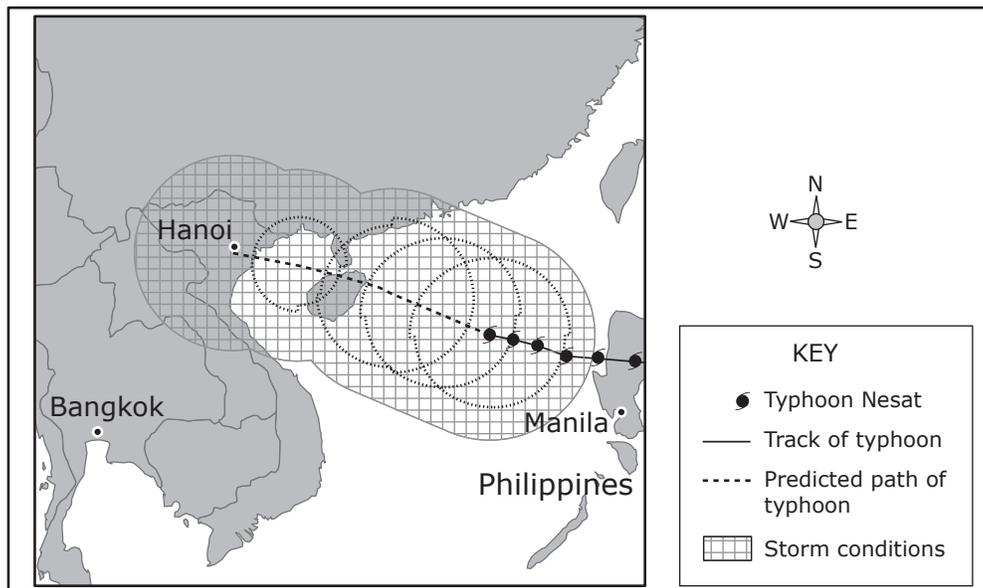
Metal	Mass (g)	Volume (cm^3)
1	22.1	3.00
2	42.0	4.00
3	9.32	5.00
4	8.13	3.00

Which of the metals was selected?

- F** Metal 1
- G** Metal 2
- H** Metal 3
- J** Metal 4

- 37** In 2011, Typhoon Nesat struck the Philippines and caused widespread flooding. After hitting the Philippines, Typhoon Nesat was predicted to hit the large city of Hanoi, Vietnam.

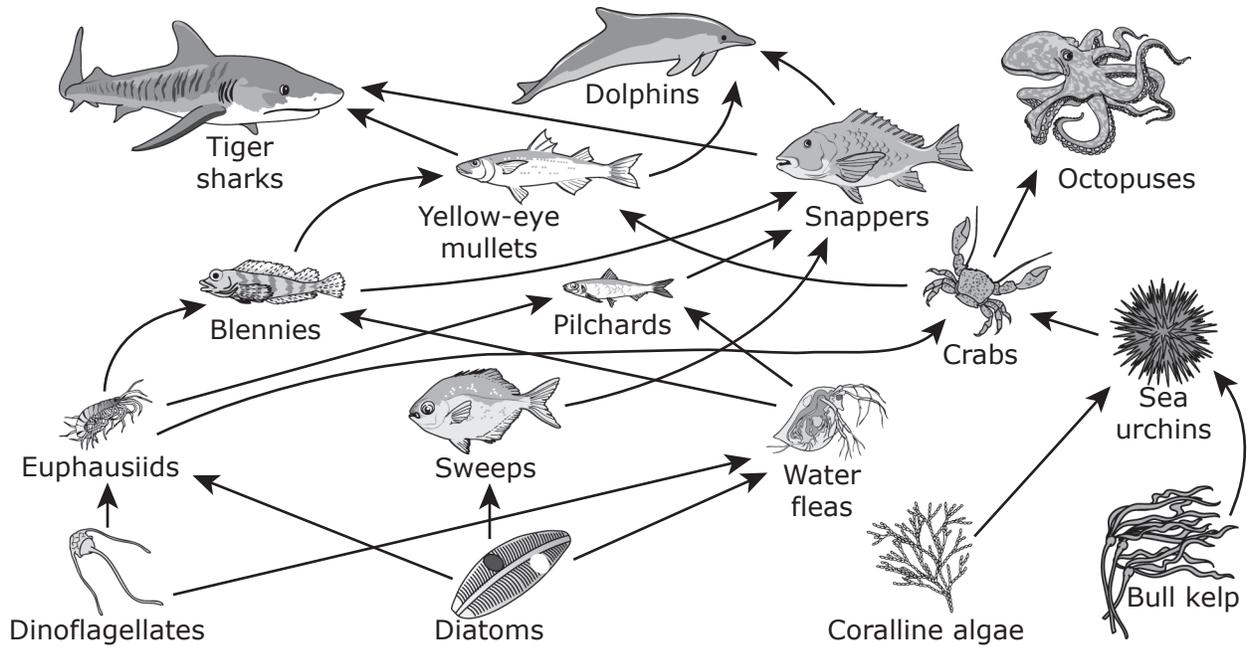
Predicted Path of Typhoon Nesat



If Typhoon Nesat had continued along the same path, which development would most likely have reduced its strength before it hit Hanoi?

- A** The formation of a low-pressure area south of Bangkok
- B** The formation of a high-pressure area south of Bangkok
- C** Cool water moving into the sea east of Hanoi
- D** Warm water moving into the sea east of Hanoi

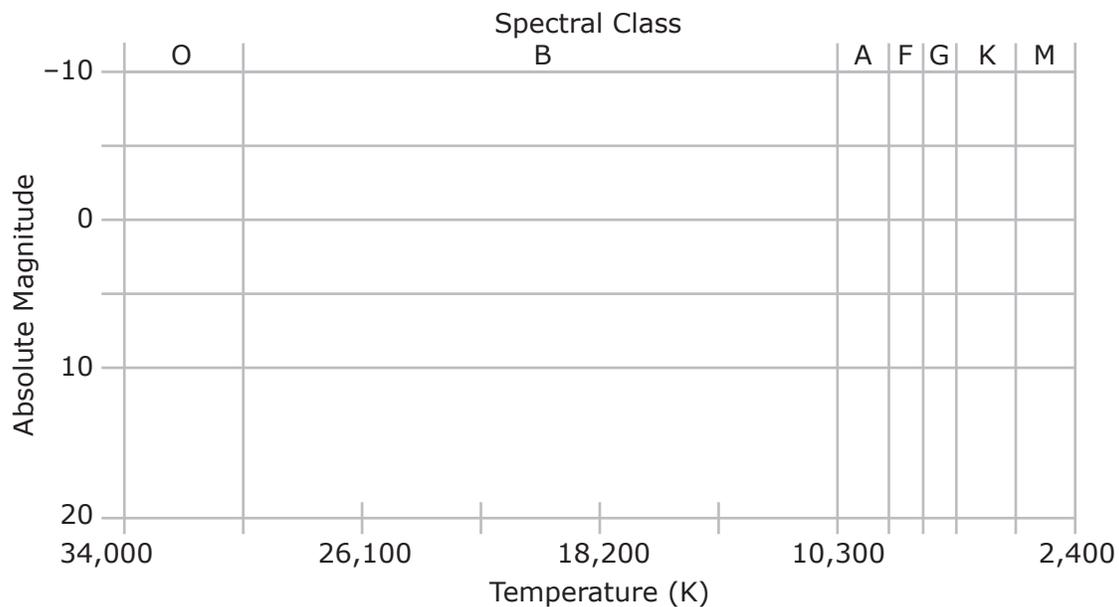
38 A partial marine food web is shown.



Which organisms all consume the same producer?

- F Crabs, pilchards, blennies
- G Euphausiids, sweeps, water fleas
- H Tiger sharks, dolphins, octopuses
- J Sea urchins, crabs, octopuses

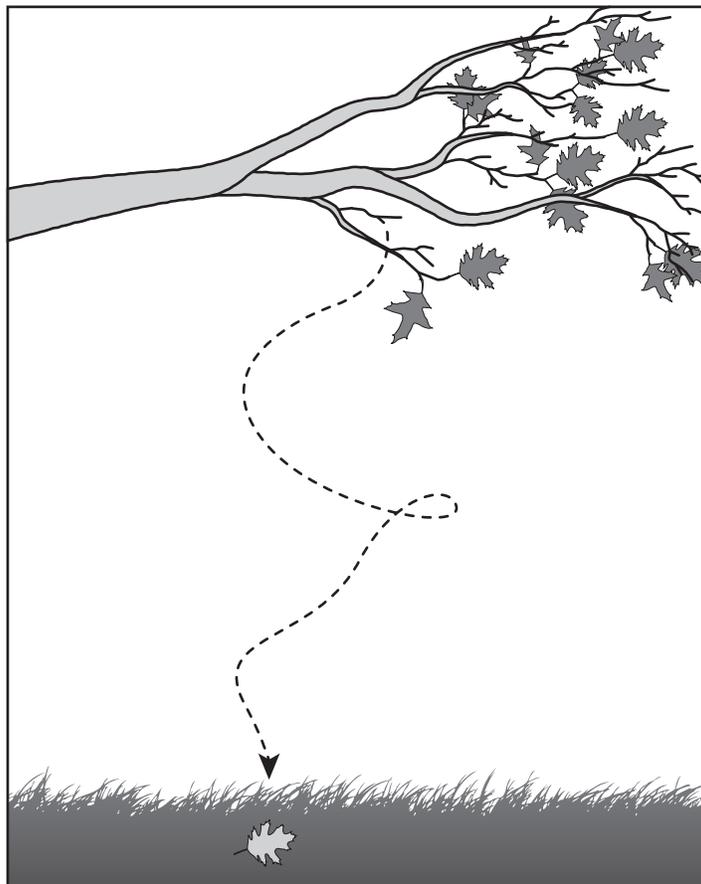
- 39 Barnard's Star is about 5.9 light-years from the sun. The star has an approximate temperature of 2,800 K.



Based on the diagram, what spectral class does Barnard's Star belong to?

- A Spectral class O
- B Spectral class B
- C Spectral class A
- D Spectral class M

40 A leaf fell from a tree branch. The path it followed is shown in the diagram below.



Which of these best describes why the leaf fell in a crooked path instead of straight down?

- F Objects with irregular shapes never fall in straight lines.
- G Air currents and gravity applied changing and unbalanced forces to the leaf.
- H The upward force of the air on the leaf was greater than the downward force of gravity.
- J Once the leaf was in motion, it continued moving in the same direction because the forces were balanced.

- 41** The strangler fig is a vine that starts out as a seed in the tree canopy of the rain forest. It drops its roots down from the canopy to the forest floor.



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By sprouting in the rain-forest canopy, the strangler fig seedling is exposed to more —

- A** sunlight
- B** soil
- C** nutrients
- D** consumers

-
- 42** A student is using colored beads to make a model of aluminum sulfate, $\text{Al}_2(\text{SO}_4)_3$. Aluminum atoms are represented by blue beads, sulfur atoms by yellow beads, and oxygen atoms by green beads.

What combination of beads should the student use for the model?

- F** 6 blue, 3 yellow, and 7 green
- G** 2 blue, 1 yellow, and 4 green
- H** 2 blue, 3 yellow, and 12 green
- J** 6 blue, 12 yellow, and 12 green

**STAAR
GRADE 8
Science
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