

GRADE 8
Science

Administered May 2018

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 4.0026 Helium	3 Li 6.94 Lithium	4 Be 9.0122 Beryllium	5 B 10.81 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 28.085 Silicon	15 P 30.974 Phosphorus	16 S 32.06 Sulfur	17 Cl 35.45 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 72.630 Germanium	33 As 74.922 Arsenic	34 Se 78.971 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 95.95 Molybdenum	43 Tc Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.91 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.87 Silver	48 Cd 112.41 Cadmium	49 In 114.82 Indium	50 Sn 118.71 Tin	51 Sb 121.76 Antimony	52 Te 127.60 Tellurium	53 I 126.90 Iodine	54 Xe 131.29 Xenon														
55 Cs 132.91 Cesium	56 Ba 137.33 Barium	57 La 138.91 Lanthanum	58 Ce 140.12 Cerium	59 Pr 140.91 Praseodymium	60 Nd 144.24 Neodymium	61 Pm Promethium	62 Sm 150.36 Samarium	63 Eu 151.96 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.93 Terbium	66 Dy 162.50 Dysprosium	67 Ho 164.93 Holmium	68 Er 167.26 Erbium	69 Tm 168.93 Thulium	70 Yb 173.05 Ytterbium	71 Lu 174.97 Lutetium	72 Hf 178.49 Hafnium														
87 Fr Francium	88 Ra Radium	89 Ac Actinium	90 Th 232.04 Thorium	91 Pa 231.04 Protactinium	92 U 238.03 Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson

Atomic number — 14
Symbol — **Si**
Atomic mass — 28.085
Name — Silicon

Atomic masses are not listed for elements with no stable or common isotopes.

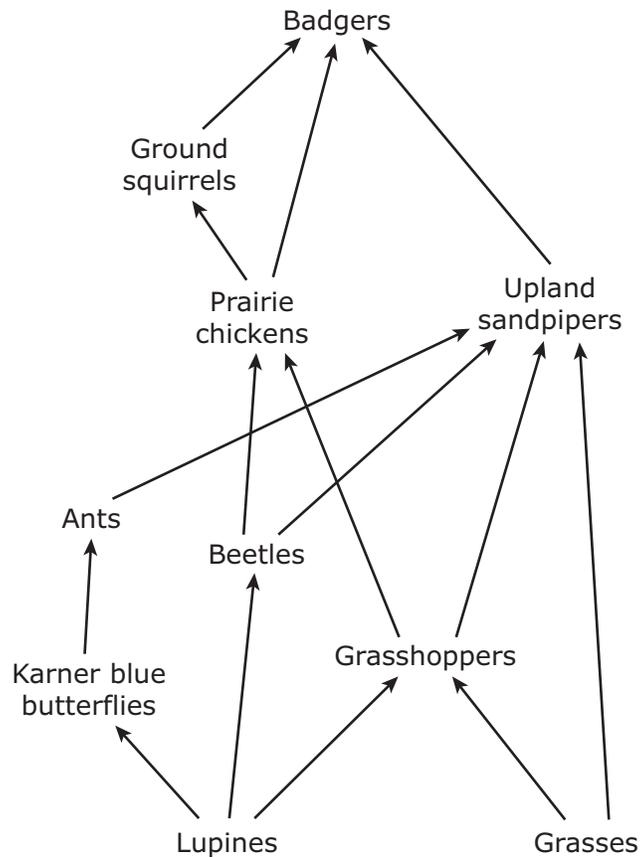
Lanthanide Series		57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium
Actinide Series		89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium

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 partial grassland food web is shown.



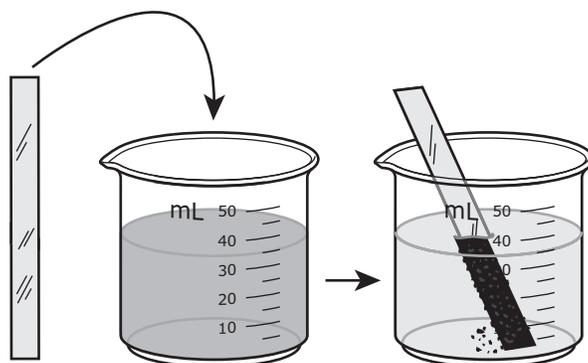
Which of the following best describes a relationship in this grassland?

- A** Badgers are top predators because they eat upland sandpipers and beetles.
- B** A producer–consumer relationship exists between lupines and ants.
- C** A predator–prey relationship exists between beetles and ground squirrels.
- D** Upland sandpipers are primary and secondary consumers because they eat grasses and grasshoppers.

2 Which statement about stars is correct?

- F Star formation begins in a nebula.
- G White dwarfs become main-sequence stars when they gain mass.
- H Supergiants are stars that can absorb black holes.
- J Main-sequence stars are formed by comets.

3 For a laboratory investigation some students put a strip of shiny metal into a beaker of blue solution and then stored the beaker on a shelf overnight. The next morning, the students recorded observations about the metal and the solution in the box below.



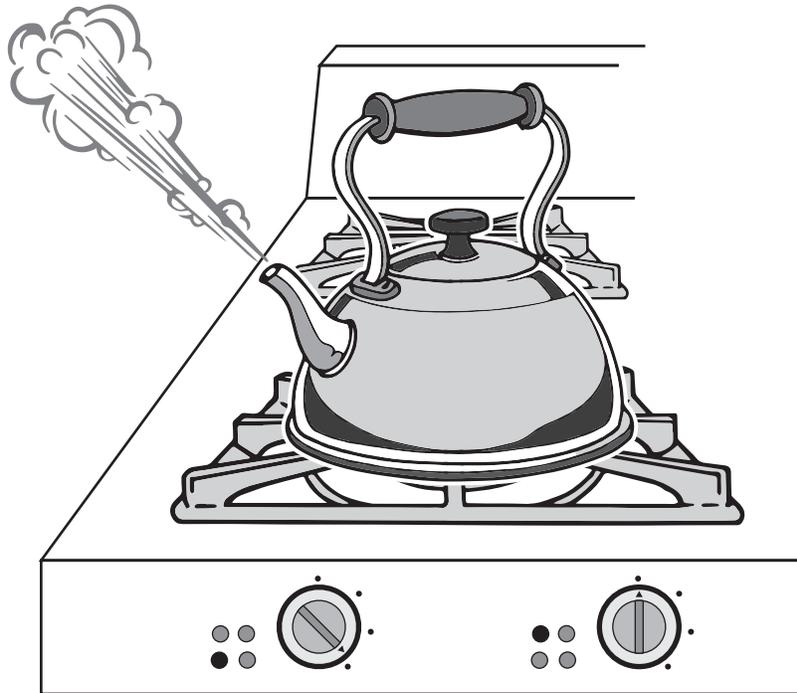
Students' Observations

- The solution is lighter in color.
- The volume of solution is the same.
- The metal strip is shiny above the surface of the solution.
- The metal strip is not shiny below the surface of the solution.
- The metal strip below the surface of the solution has a dark coat of flaky material.
- When the metal strip is touched, the flaky material falls off.

Based on their observations, can the students correctly conclude that a chemical reaction occurred?

- A No, because the metal strip was still visible
- B Yes, because a new material of a different color formed on part of the metal strip
- C No, because the solution stayed blue
- D Yes, because the volume of the blue solution stayed the same

- 4 Which statement describes the energy changes that occur when water in a tea kettle is heated on a stove that uses natural gas?



- F** Some of the chemical energy in the natural gas transforms into thermal energy, which heats the water. Then some of the thermal energy changes into sound energy when the water forms steam and the steam leaves the kettle.
- G** Some of the thermal energy in the natural gas transforms into sound energy when the water becomes hot. Then some of the sound energy changes into light energy when the kettle becomes warm.
- H** Some of the electrical energy in the natural gas transforms into thermal energy, which causes the water to form steam. Then some of the thermal energy changes into sound energy and light energy when the steam leaves the kettle.
- J** Some of the light energy in the natural gas transforms into chemical energy in the water. Then some of the chemical energy changes into kinetic energy when steam leaves the kettle and into sound energy when the water boils.

- 5** To fight a bacterial infection, a patient was given an antibiotic to take for 10 days. After the patient finished taking the antibiotics as directed, almost all the bacteria were killed. After another 10 days, the patient was sick again with the same type of infection.

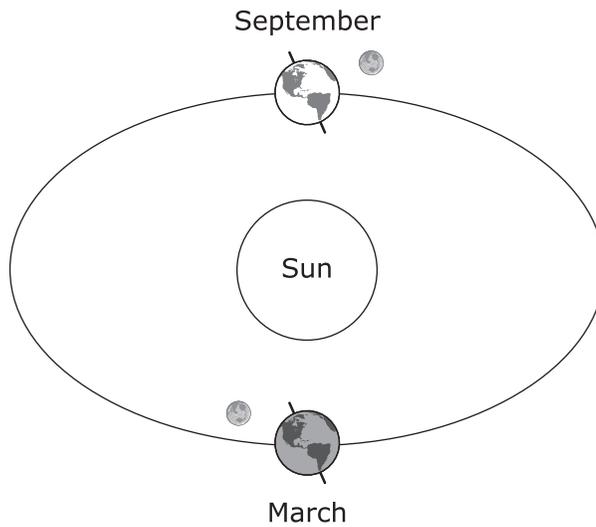
What most likely happened?

- A** A few bacteria survived the antibiotics and stopped reproducing.
 - B** The patient's high fever inactivated the antibiotic, allowing the surviving bacteria to grow rapidly.
 - C** The antibiotic slowed the life cycle of the bacteria.
 - D** Some of the bacteria were resistant to the antibiotic, and they reproduced.
-

- 6** A 1,100 kg car comes uniformly to a stop. If the vehicle is accelerating at -1.2 m/s^2 , which force is closest to the net force acting on the vehicle?

- F** $-9,600 \text{ N}$
- G** $-1,300 \text{ N}$
- H** -900 N
- J** -94 N

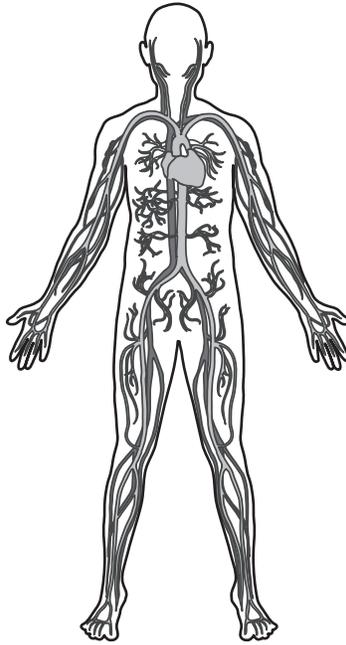
- 7 The beginning of autumn in North America is in September, but the beginning of autumn in South America is in March. The diagram shows the positions of Earth, the moon, and the sun on one day in September and one day in March.



Why does autumn start in different months of the year in North America and South America?

- A Earth's orbit around the sun is not a perfect circle.
- B North America has a larger landmass than South America.
- C The moon has a greater pull on South America than on North America.
- D Earth's axis has a 23.5° tilt.

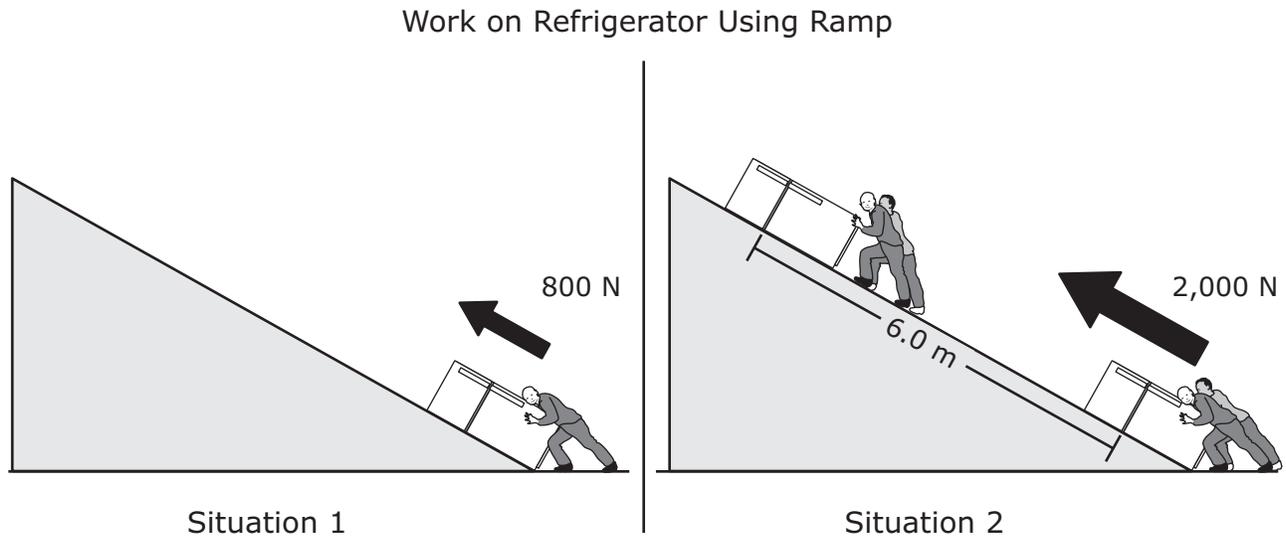
8 This drawing shows a human body system.



What is the primary function of this body system?

- F** The protection of vital organs from injury
- G** The chemical breakdown of food into smaller pieces
- H** The transport of nutrients, water, and oxygen to body cells
- J** The production of hormones that regulate growth and metabolism

- 9 The diagram of Situation 1 shows one person failing to move a refrigerator up a ramp, while the diagram of Situation 2 shows two people successfully pushing a refrigerator up a ramp.



What comparison can be made about the work done in the two situations?

- A In Situation 1, no work was done, while 12,000 J of work was done in Situation 2.
 - B In Situation 1, 1,600 J of work was done, while 3,000 J of work was done in Situation 2.
 - C In Situation 1, no work was done, while 8,000 J of work was done in Situation 2.
 - D In Situation 1, 400 J of work was done, while 1,300 J of work was done in Situation 2.
-
- 10 An ecosystem that is not sustainable can break down when a natural disaster occurs. This can lead to organisms in the ecosystem either leaving the area or dying off.

Increased biodiversity results in a more sustainable ecosystem because —

- F a greater number of plant species means that there is less barren land
- G a greater variety of species present allows more organisms to adapt after changes occur
- H the transition area between two ecosystems is narrower
- J there are fewer species to be affected by environmental stresses

- 11** How many valence electrons are in an atom of each element in Group 15 in the periodic table?

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

- 12** The photograph shows mountains in the Andes range in South America.

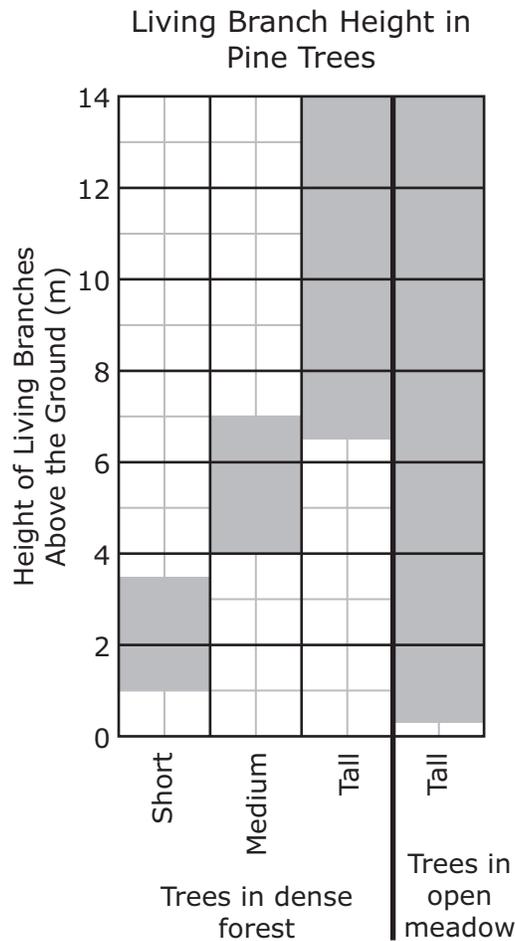


© Light Traces Photography

Which statement describes the geologic process that is most likely responsible for the formation of these mountains?

- F** They are along a transform plate boundary that is no longer active, so erosion is creating deep valleys.
- G** They are along a transform plate boundary in which plates are currently moving side by side, causing earthquakes and faults.
- H** They are along a plate boundary in which plates are currently converging, causing uplift and steep slopes.
- J** They are along a plate boundary in which plates diverged in the distant past, allowing new rock to build up.

- 13** A group of scientists studied some trees in a pine forest. In the densely forested areas, the trees were within 1 m of each other. The scientists observed that these trees had dead branches near the ground. They measured the height above the ground at which the first living branches were found on different-sized trees in the forest. Then they repeated this procedure on the same kind of trees in an open meadow. This graph summarizes the scientists' data.

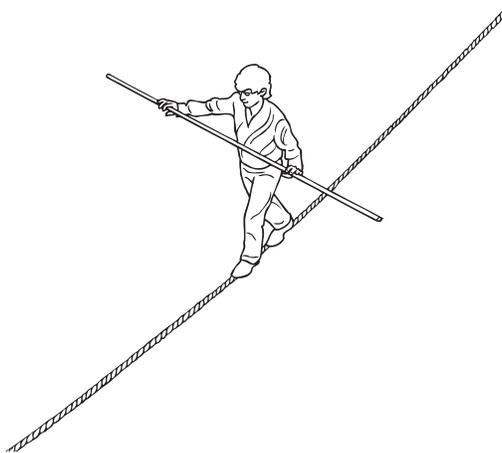


Source: Went, F. W., "Competition Among Plants," *PNAS*, Feb. 1973

Which inference is best supported by these data?

- A** Pine trees in a dense forest can grow taller than pine trees in an open meadow.
- B** Pine trees in a dense forest compete for sunlight with the surrounding trees.
- C** Pine trees in a dense forest are part of a less-complex food web than pine trees in an open meadow.
- D** Pine trees in a dense forest have more living branches than pine trees in an open meadow.

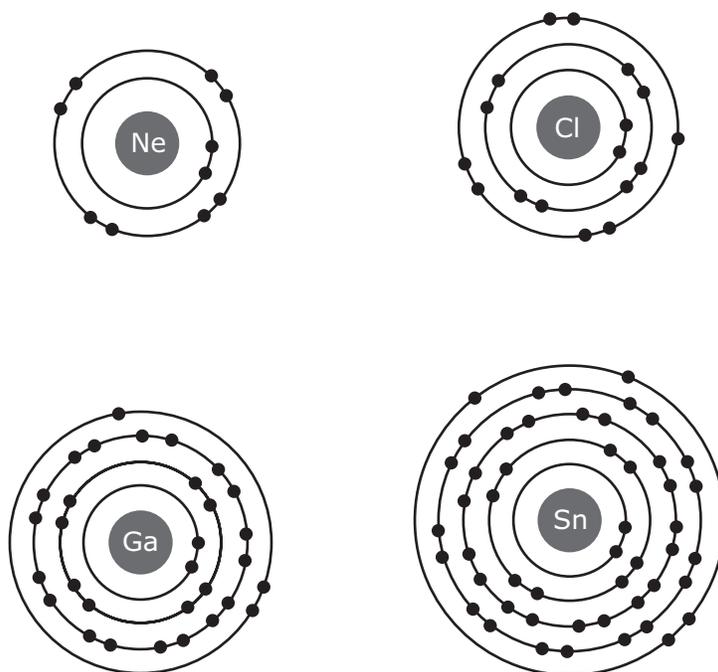
14 The picture shows an aerialist walking on a tightrope and holding a balancing bar.



An action–reaction pair of forces exists between —

- F the aerialist’s feet and the rope
- G the rope and the balancing bar
- H the two ends of the rope
- J the aerialist’s arms and legs

15 A student drew atomic models of four elements.



Based on these drawings, which element is the least reactive?

- A Neon, because it has two energy levels with eight electrons in the second level
- B Chlorine, because it has three energy levels with seven electrons in the third level
- C Gallium, because it has four energy levels with three electrons in the fourth level
- D Tin, because it has five energy levels with four electrons in the fifth level

- 16** The table lists the distances of some of the nearest stars.

Some Nearby Stars

Star	Distance from the Sun (light-years)
Proxima Centauri	4.2
Barnard's Star	6.0
Wolf 359	7.7
Sirius A	8.6
Ross 248	10.4

Based on the table, a student used a measuring tape to model the distances between the sun and these nearby stars. The sun was at the starting point. Proxima Centauri was at the 10 m mark.

Which star was closest to the 20 m mark in this model?

- F** Barnard's Star
- G** Wolf 359
- H** Sirius A
- J** Ross 248

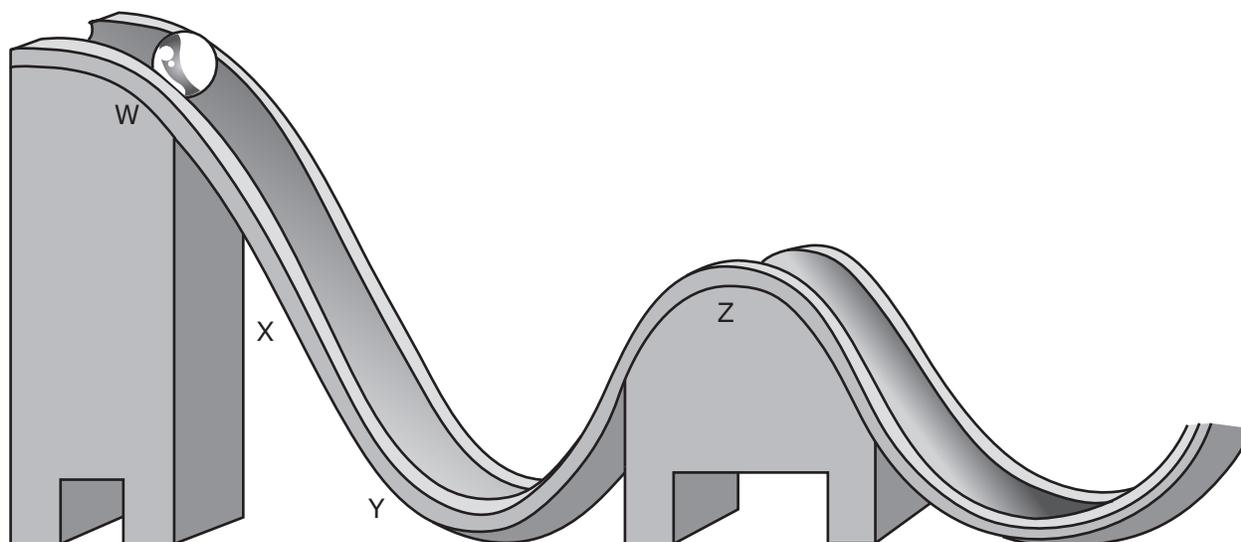
-
- 17** Lions and cheetahs prey on wildebeests that graze in the grasslands of the African savanna. What likely effect would increased rainfall over several rainy seasons have on the populations of wildebeests, lions, and cheetahs?
- A** All three populations would increase.
 - B** The wildebeest population would decrease, and the lion and cheetah populations would increase.
 - C** The wildebeest population would increase, and the lion and cheetah populations would decrease.
 - D** All three populations would decrease.

- 18** Which statement accurately describes the atoms of a specific element?
- F** An indium, In, atom contains 115 protons inside the nucleus and 49 neutrons outside the nucleus.
 - G** A scandium, Sc, atom contains 45 electrons outside the nucleus and 21 neutrons inside the nucleus.
 - H** An aluminum, Al, atom contains 27 electrons and 27 protons inside the nucleus.
 - J** A zinc, Zn, atom contains 30 protons inside the nucleus and 30 electrons outside the nucleus.
-

- 19** A student notices that the moon is full one evening. Which sequence of moon phases will the student observe over the next eight days?
- A** Full, waning gibbous, third quarter
 - B** Full, waning gibbous, first quarter, waning crescent
 - C** Full, new, waning gibbous
 - D** Full, waxing gibbous, new, waning crescent
-

- 20** Which statement does NOT correctly compare silicon with another element?
- F** Silicon is a better conductor of electricity than sulfur.
 - G** Silicon conducts electricity as well as copper does.
 - H** Silicon is a solid at room temperature, but argon is a gas.
 - J** Silicon is less malleable than silver.

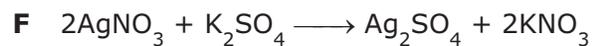
- 21 A marble is given potential energy by being placed at Location W. When the marble is released, it rolls down the track.



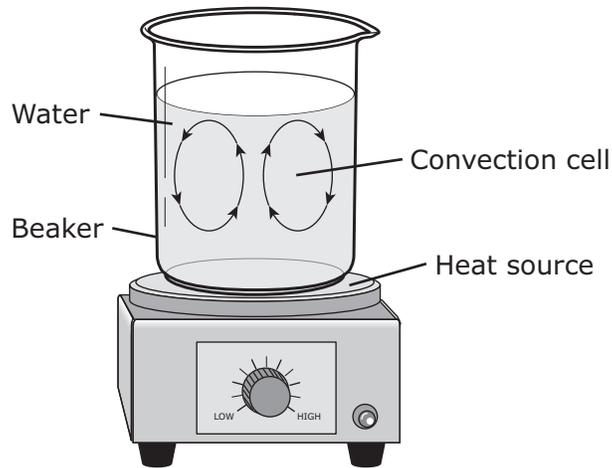
At which location does the marble have maximum kinetic energy?

- A Location W
- B Location X
- C Location Y
- D Location Z

-
- 22 Which chemical reaction involves the fewest oxygen atoms?



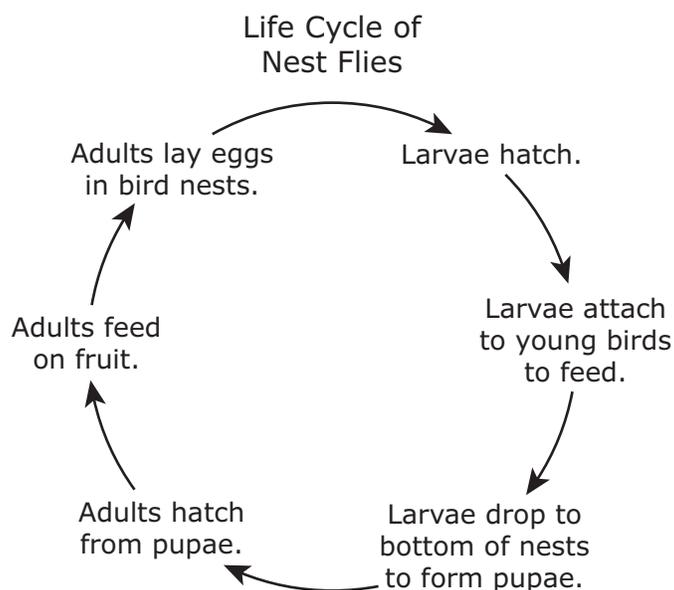
23 A student models convection currents in a laboratory activity.



How are the convection currents in the student's model different from the convection currents in Earth's atmosphere and oceans?

- A** The warm air in Earth's atmosphere and the warm water in Earth's oceans sink instead of rise.
- B** The heat source for Earth's atmosphere and oceans is the sun, which heats from above instead of below.
- C** Convection cells in Earth's atmosphere and oceans flow in the same direction instead of opposite directions.
- D** Cold air in Earth's atmosphere and cold water in Earth's oceans are less dense than warm air and warm water instead of being more dense.

- 24** Darwin's finches are a group of seed-eating bird species found on the Galápagos Islands. Nest flies are a type of insect that has become a threat to the finches. The diagram shows the life cycle of the nest fly.



Based on the life-cycle information, which statement best describes the relationship between the nest fly larvae and the young birds?

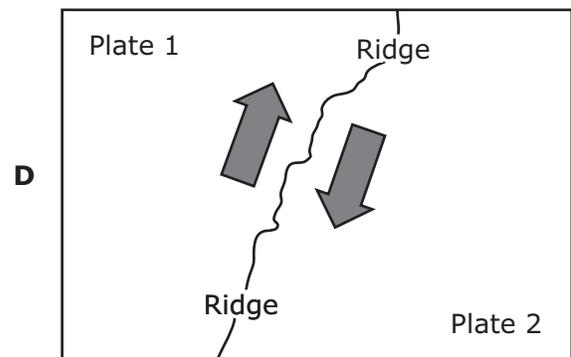
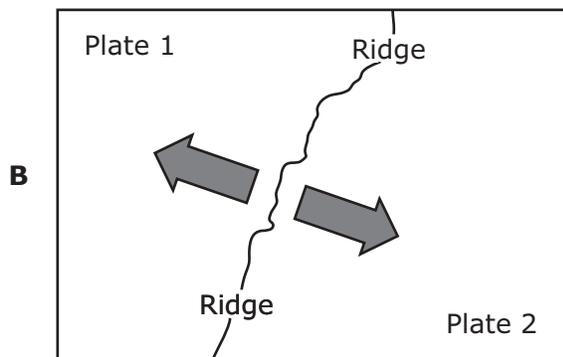
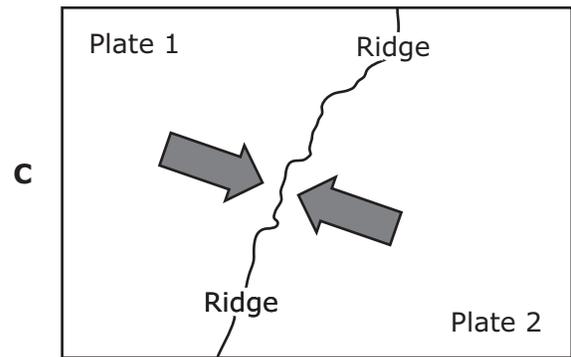
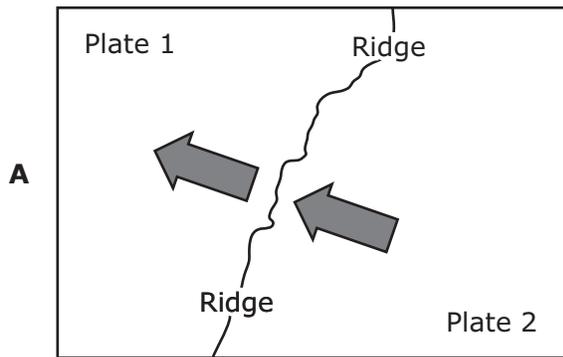
- F** The larvae are prey for the young birds.
 - G** The larvae are predators of the young birds.
 - H** The young birds are hosts for the larvae.
 - J** The young birds are consumers of the larvae.
-
- 25** Sulfur hexafluoride, SF_6 , is a very stable, nonflammable gas at room temperature. It is used in many electronic products because it is a good electrical insulator.

Which statement describes the composition of sulfur hexafluoride?

- A** SF_6 is a compound containing atoms of sulfur and fluorine.
- B** SF_6 is a compound that contains seven identical atoms.
- C** SF_6 is an element with sulfur in the atom's nucleus and fluorine outside the nucleus.
- D** SF_6 is an organic compound composed of long chains of sulfur atoms surrounded by fluorine atoms.

- 26** Four boxes are sliding with constant speed before each box experiences an unbalanced force of 8 N. Which box would experience the greatest acceleration when the unbalanced force is applied?
- F** The box with a mass of 2 kg
 - G** The box with a mass of 4 kg
 - H** The box with a mass of 6 kg
 - J** The box with a mass of 8 kg

- 27** A mid-ocean ridge is located at the boundary of two tectonic plates. Which diagram correctly models the relative plate motion on each side of a mid-ocean ridge?



- 28** As part of an investigation, students combined substances in a beaker to observe chemical reactions. They performed two procedures. They measured the mass of each substance before and after each reaction. The table shows their observations.

	Mass of Reactants	Mass of Products
Procedure 1	100.0 g	97.5 g
Procedure 2	100.0 g	102.5 g

Assuming the students did not make any careless errors, what likely explains these changes in mass?

- F** Procedure 1: All the reactants were liquids that evaporated.
Procedure 2: A gas was formed as one product, and it escaped into the air.
- G** Procedure 1: One of the reactants was converted to thermal energy.
Procedure 2: All the products were liquids.
- H** Procedure 1: The reactants were liquids with different densities.
Procedure 2: The reactants were combined into only one product.
- J** Procedure 1: One of the products was a gas that escaped into the air.
Procedure 2: A gas from the air reacted with one of the other reactants.

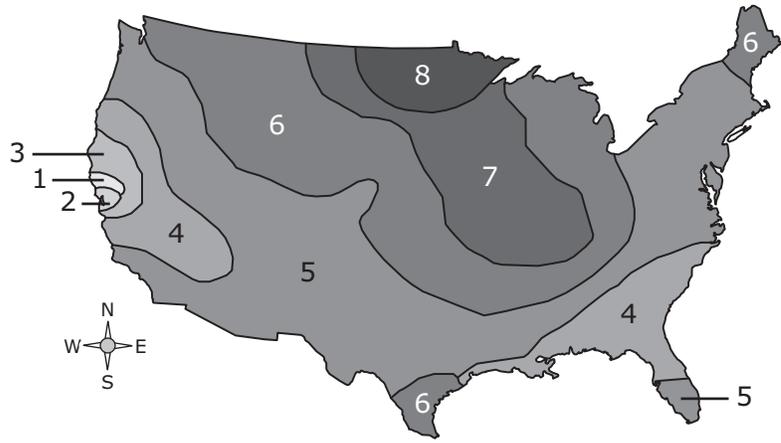
- 29** The house sparrow was first introduced to New York in 1851. It is now distributed across most of North America. As the species expanded its range, it began to live in environments that were different from its original habitat. The birds now vary in size, depending on their geographic location. The map shows the distribution of house sparrows by size.

House Sparrow



© Paul Lemke/Dreamstime.com

House Sparrow Distribution in North America

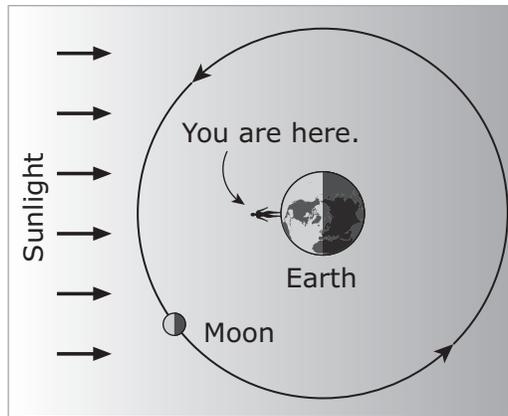


Source: University of California Museum of Paleontology's *Understanding Evolution*

What is the most likely explanation for the body-size distribution of house sparrows shown on the map?

- A** Cold temperatures in the North favored the survival of populations of larger sparrows over populations of smaller sparrows.
- B** High elevations in the West provided a survival advantage for populations of larger sparrows over populations of smaller sparrows.
- C** Warm temperatures in the South allowed populations of larger sparrows to survive over populations of smaller sparrows.
- D** Coastal environments in the East tended to give a survival advantage to populations of larger sparrows over populations of smaller sparrows.

30 A student shows a model of Earth and the moon to a class.



Which picture shows how the moon appears from Earth when it is in the position shown in this model?



Waxing gibbous



Waning crescent



Waning gibbous



Waxing crescent

- 31** Four students were asked to complete a table for a science assignment. Each student selected one chemical element from each of four groups in the periodic table and then classified each element as a metal, a nonmetal, or a metalloid.

Which table was completed correctly?

A Information About
Some Chemical Elements

Group	Symbol	Classification
13	B	Metalloid
15	N	Metal
2	Ra	Nonmetal
18	He	Metal

C Information About
Some Chemical Elements

Group	Symbol	Classification
10	Ni	Nonmetal
14	C	Metalloid
2	Mg	Metal
6	Pb	Metal

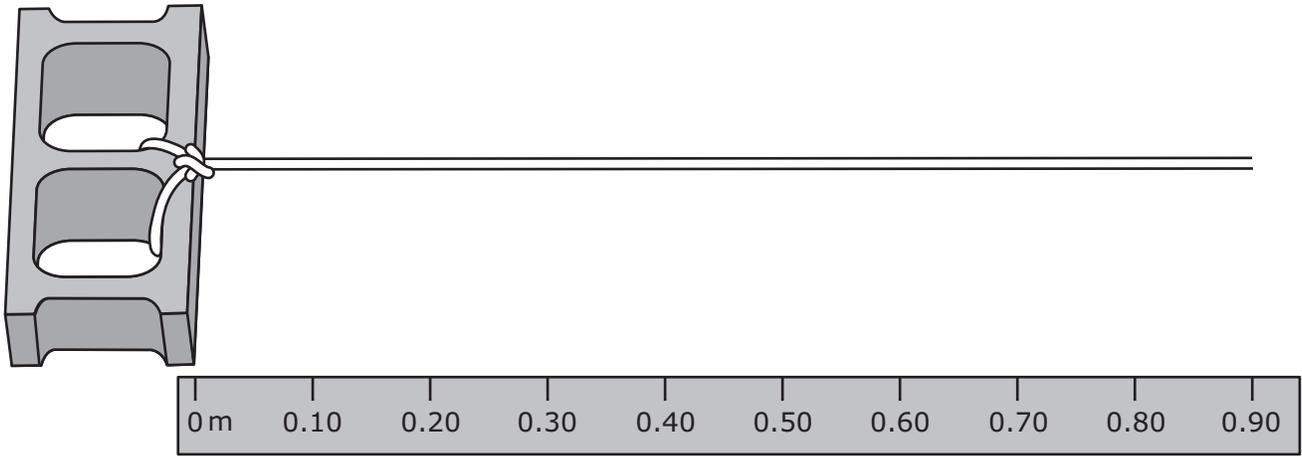
B Information About
Some Chemical Elements

Group	Symbol	Classification
17	I	Nonmetal
2	Ca	Metal
1	Rb	Metal
15	As	Metalloid

D Information About
Some Chemical Elements

Group	Symbol	Classification
11	Cu	Metal
15	Sb	Metal
16	S	Metalloid
2	Ne	Nonmetal

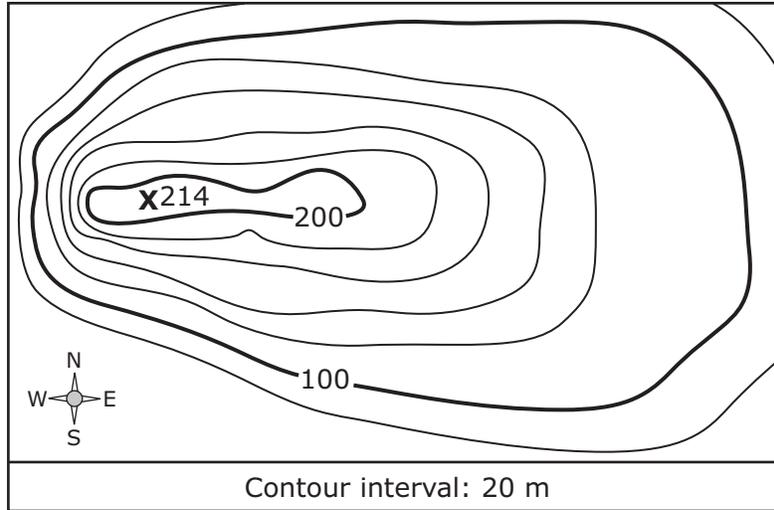
32 A block is pulled 0.90 m to the right in 2.5 s.



What is the block's average speed to the nearest hundredth of a m/s?

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

- 33 This topographic map represents the elevation of an area 100 years ago. At that time the highest point had an elevation of 214 m. The highest point has since eroded a total of 7 m.



Which profile most likely represents the landscape today?

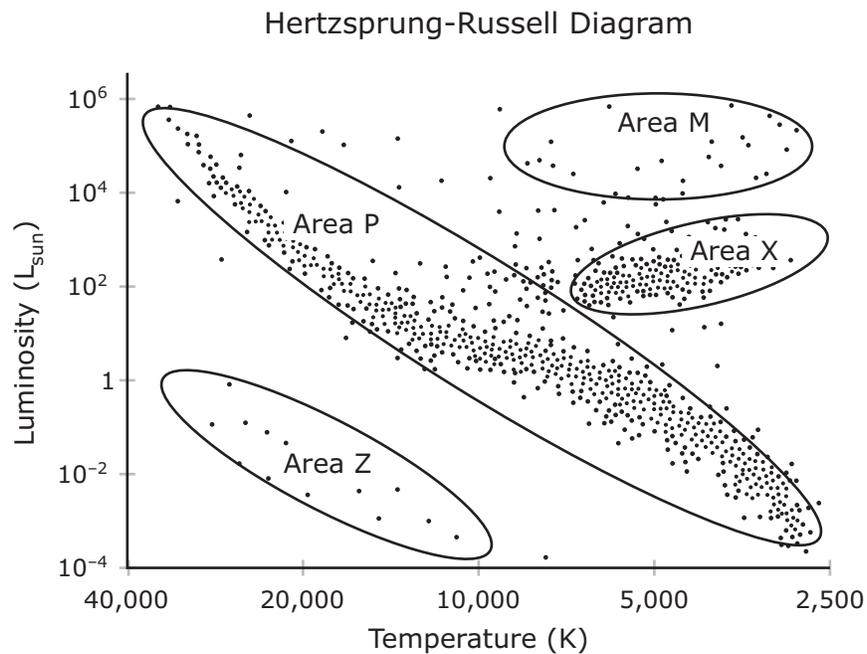
- A** 207 m
West East
- B** 207 m
West East
- C** 207 m
West East
- D** 207 m
West East

- 34** Some areas of an ocean are known as dead zones. These zones form when excess organic material decomposes. This increased decomposition uses up the oxygen from the water.

Which human activity is most affected by the increasing number of dead zones in the ocean?

- F** Offshore oil drilling, because water in dead zones is toxic
- G** Commercial fishing, because fish cannot survive without oxygen
- H** Commercial shipping, because dead zones change the course of ocean currents
- J** Sand mining, because oxygen is not available to form the sands on ocean beaches

- 35** Most stars in the universe fit into one of the four areas on this Hertzsprung-Russell diagram.



Which area of the diagram represents the white dwarfs?

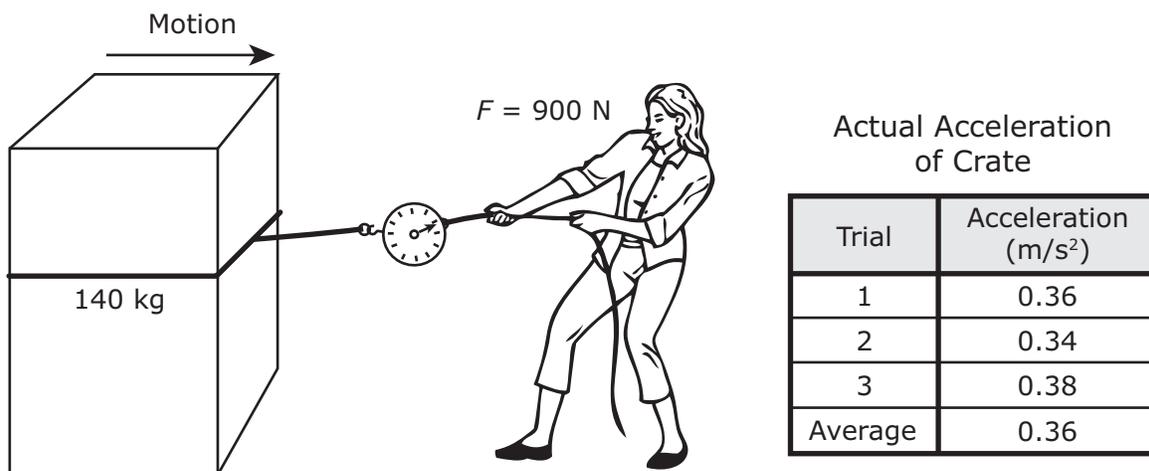
- A** Area M
- B** Area X
- C** Area P
- D** Area Z

- 36** Both the esophagus and the small intestine are involved in the digestion of food. The esophagus squeezes food into the stomach by wave-like muscle contractions. Peptidase enzymes in the small intestine break food molecules into smaller molecules.

Which statement best describes changes to food during digestion?

- F** The muscle contractions result in physical changes, while the action of the peptidase results in chemical changes.
- G** The muscle contractions and the action of the peptidase both result only in physical changes.
- H** The muscle contractions result in chemical changes, while the action of the peptidase results in physical changes.
- J** The muscle contractions and the action of the peptidase both result only in chemical changes.

- 37** A physics teacher performed a demonstration for a science class by pulling a crate across the floor and measuring the force with a spring scale. While she pulled, a student measured the acceleration of the crate with a handheld electronic device. The results of three trials are shown below.



The teacher asked the class to calculate the acceleration of the crate based on the crate's mass and the force she applied. What conclusion can be made about the difference between the calculated acceleration and the actual acceleration that occurred in the trials?

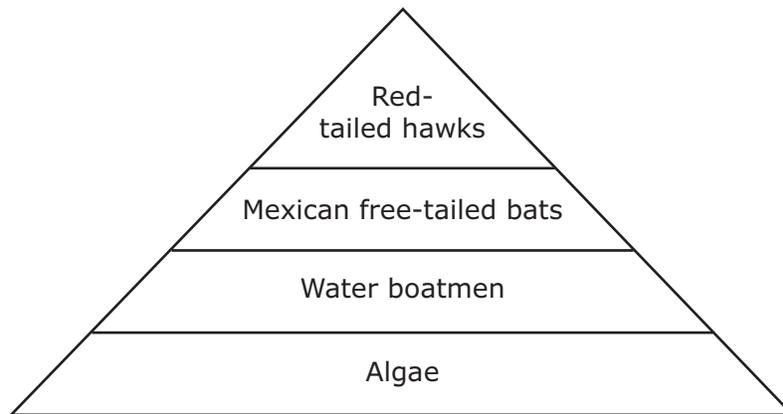
- A** Another force in the direction of the motion produced a lower acceleration than calculated.
- B** An opposing force caused by friction produced a lower acceleration than calculated.
- C** Another force in the direction of the motion produced a higher acceleration than calculated.
- D** An opposing force caused by friction produced a higher acceleration than calculated.

- 38** Wheat was one of the first plant crops that humans domesticated. In the process of domestication, the wild form of wheat was eventually changed into a form more suited to human agricultural practice.

Early farmers most likely used seeds only from wheat plants with —

- F** larger grains that could produce more food per plant
- G** taller stems that could block sunlight from weeds growing at ground level
- H** larger flowers that could be sold for additional income
- J** thinner stems that could endure heavy winds

-
- 39** An energy pyramid is shown.



Which sentence best describes how energy flows through this pyramid?

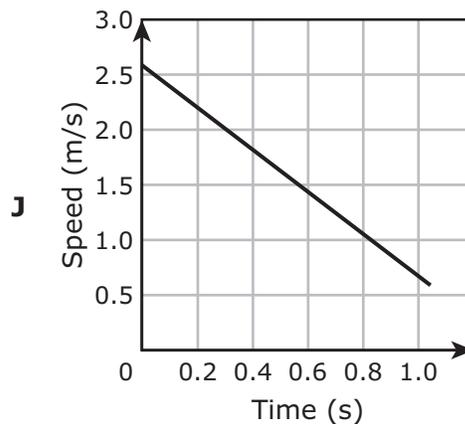
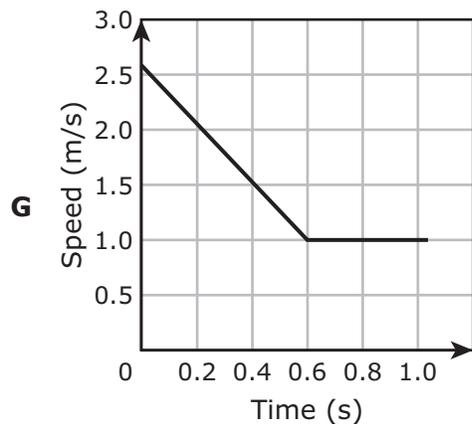
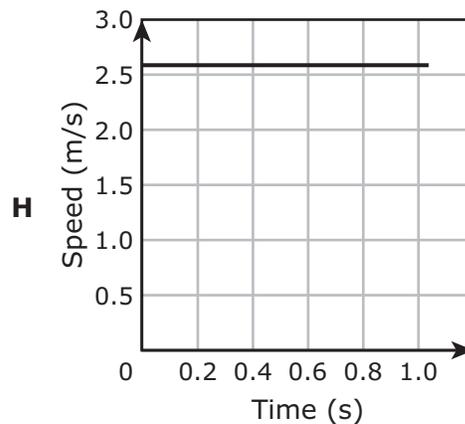
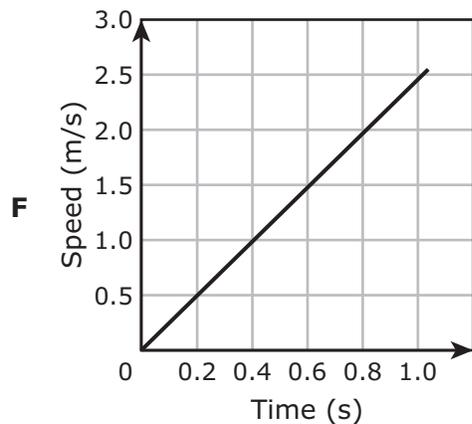
- A** Energy is transferred down each level of the energy pyramid.
- B** The energy lost at each level is consumed by organisms in the top level.
- C** Energy is transferred from organisms in one level to those in the level above.
- D** The organisms at the bottom level provide energy directly to organisms in all the other levels.

- 40 Students slid a small wood block along a flat tabletop for a distance of 1.6 m. The data show the motion of the block of wood.

Data for Motion of Wood Block

Time (s)	Speed (m/s)
0.0	2.6
0.2	2.2
0.4	1.8
0.6	1.4
0.8	1.0
1.0	0.6

Which graph displays the motion of the wood block?



41 What keeps planets in the solar system from moving in straight lines through the galaxy?

- A** Light energy
 - B** Gravity
 - C** Inertia
 - D** Potential energy
-

42 Whitetip reef sharks spend most of the day lying on the ocean floor. While remaining still, these sharks pump water across their gills.

The movement of water across their gills is necessary for —

- F** staying cool
- G** accessing food
- H** obtaining oxygen
- J** avoiding predators



**STAAR
GRADE 8
Science
May 2018**



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