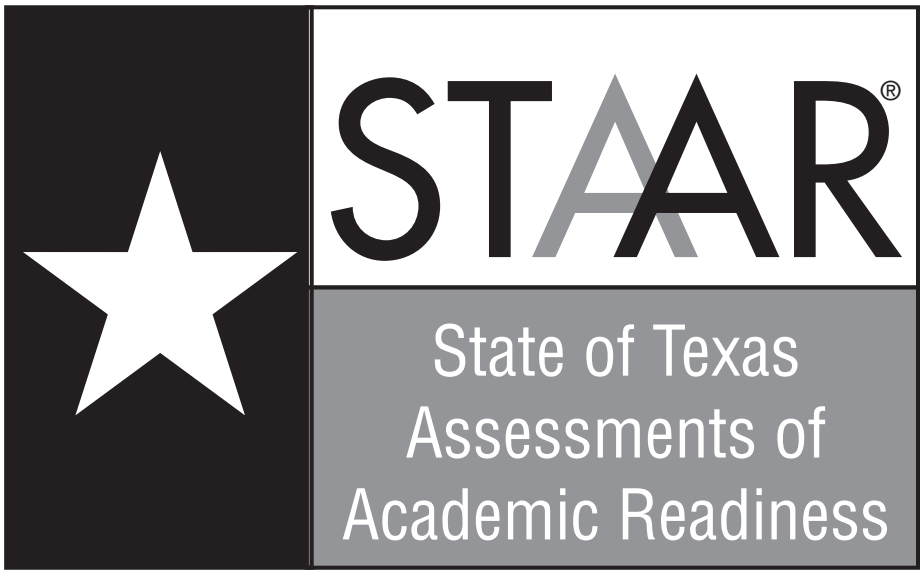


GRADE 8

Science

Administered May 2018

RELEASED

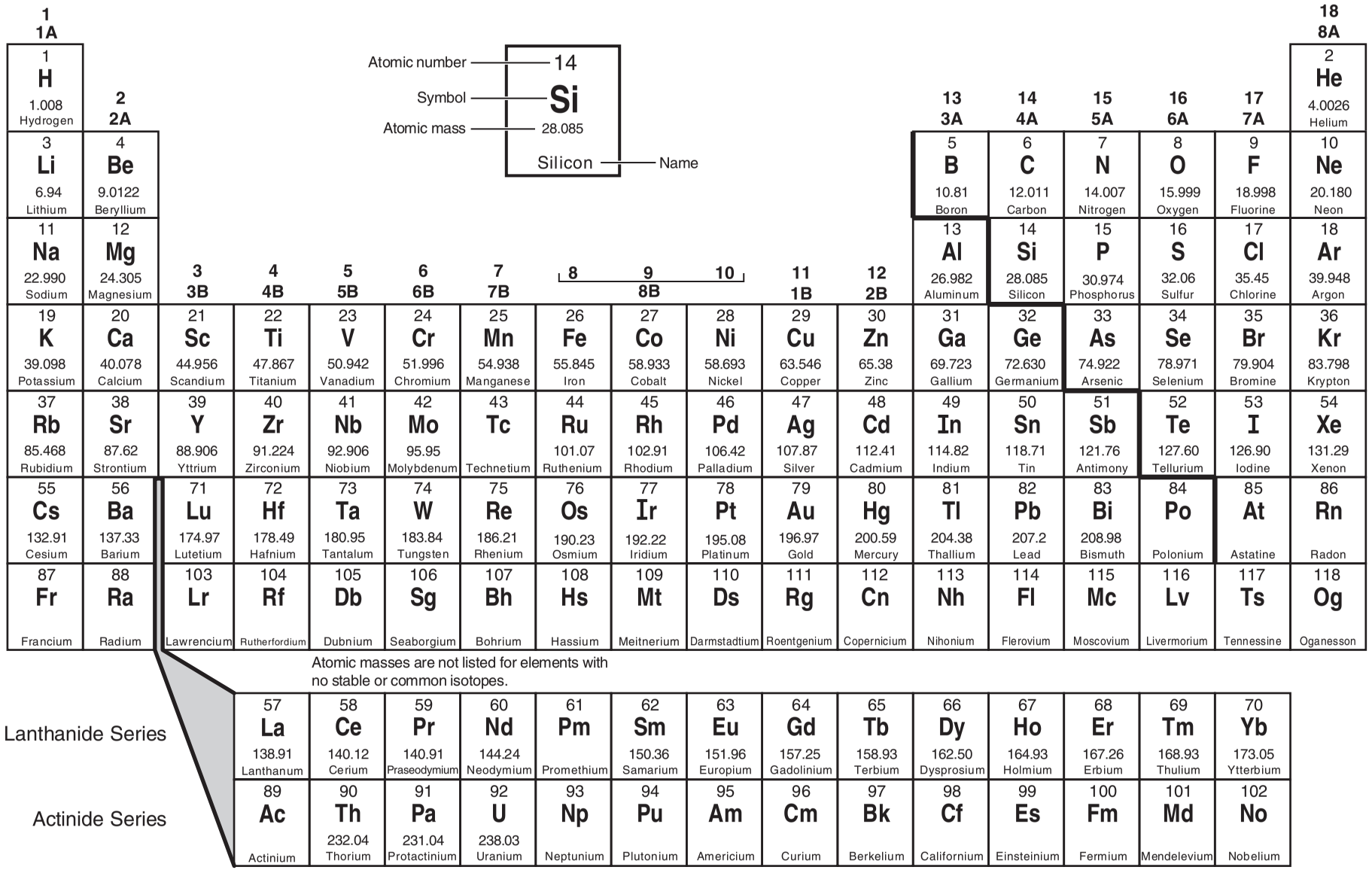
STAAR GRADE 8 SCIENCE REFERENCE MATERIALS

FORMULAS

Density $= \frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{V}$
Average speed $= \frac{\text{total distance}}{\text{total time}}$	$s = \frac{d}{t}$
Net force = (mass)(acceleration)	$F = ma$
Work = (force)(distance)	$W = Fd$

STAAR GRADE 8 SCIENCE REFERENCE MATERIALS

PERIODIC TABLE OF THE ELEMENTS



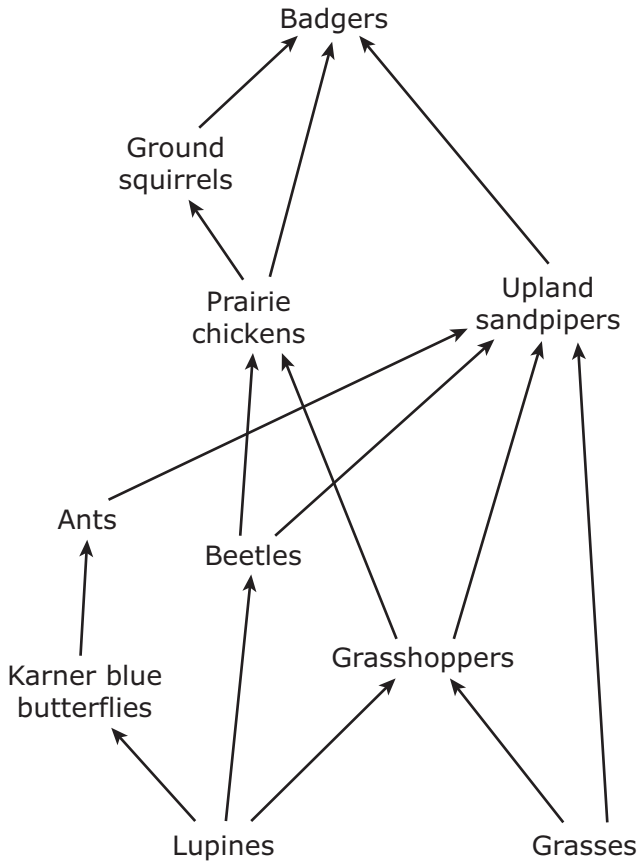
Updated 2017

Source: International Union of Pure and Applied Chemistry

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.

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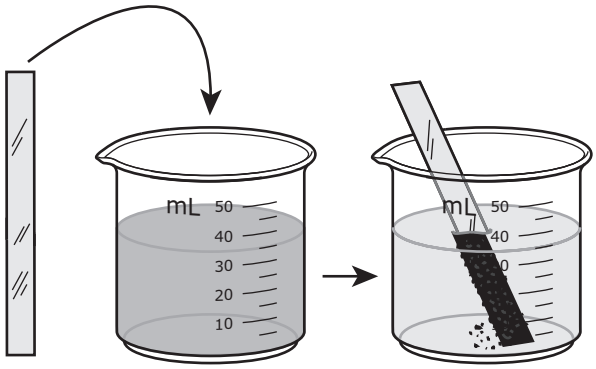
3 For a laboratory investigation some students put a strip of shiny metal into a beaker of blue solution and then stored the beaker on a shelf overnight. The next morning, the students recorded observations about the metal and the solution in the box below.



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?

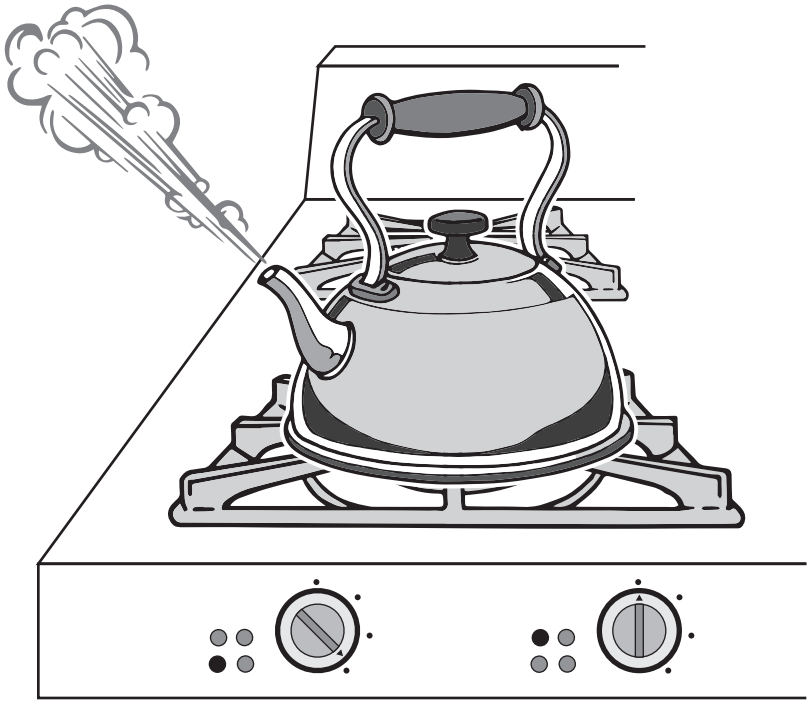
A No, because the metal strip was still visible

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?

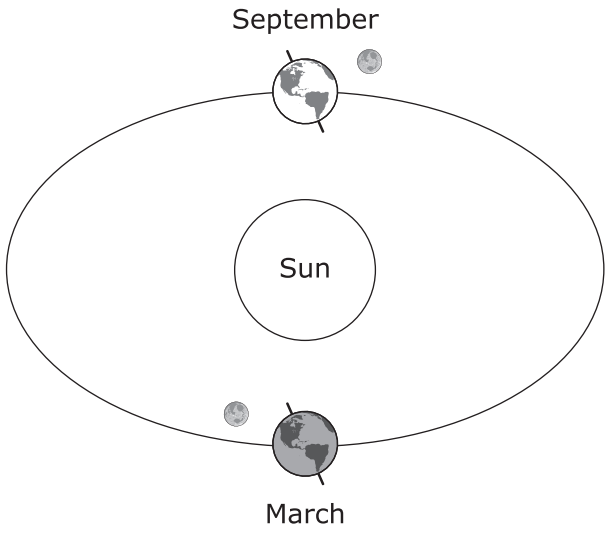
F −9,600 N

G −1,300 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?

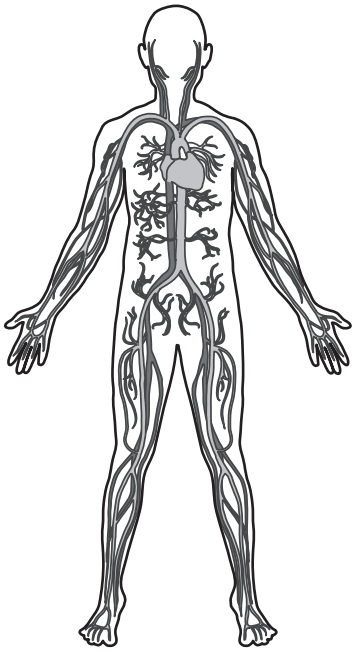
A Earth's orbit around the sun is not a perfect circle.

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

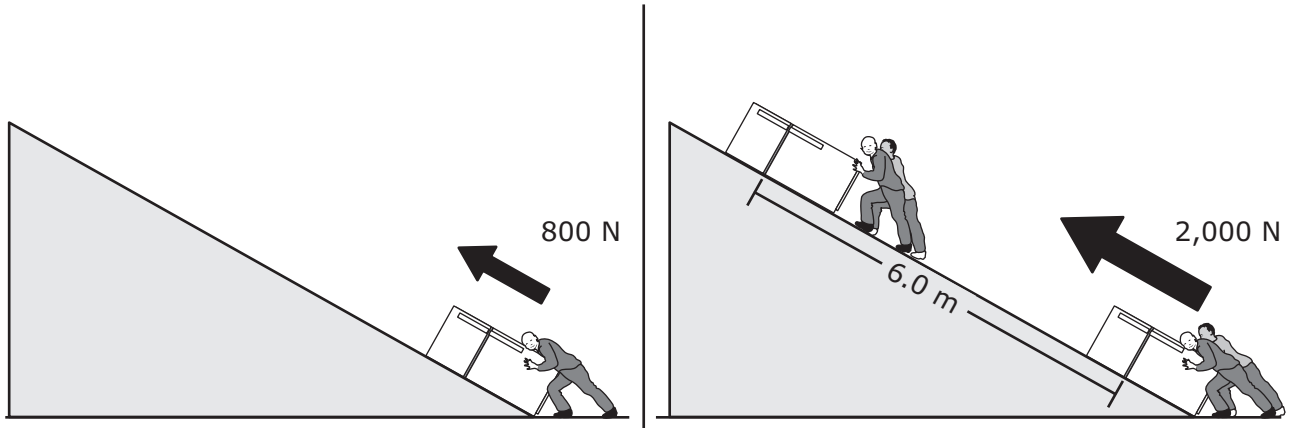
G The chemical breakdown of food into smaller pieces

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.

Work on Refrigerator Using Ramp



Situation 1 Situation 2

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.

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

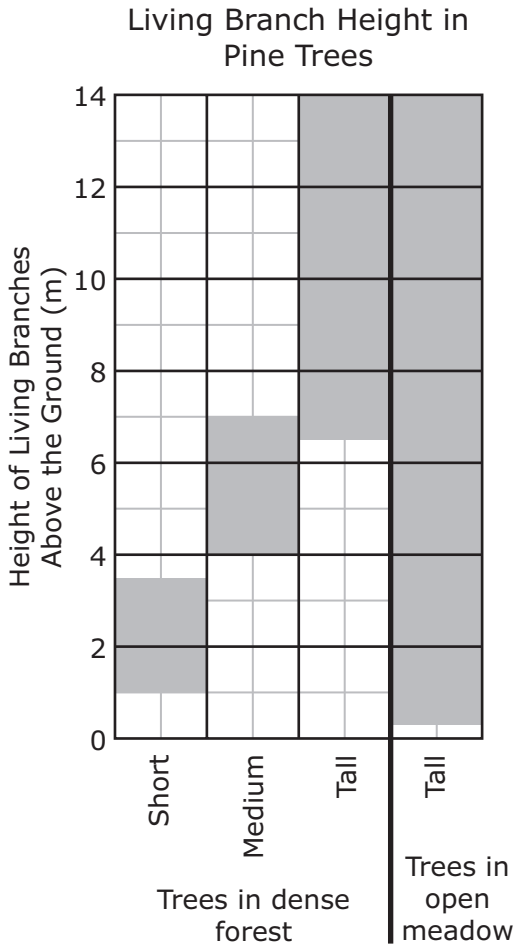
F They are along a transform plate boundary that is no longer active, so erosion is creating deep valleys.

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?

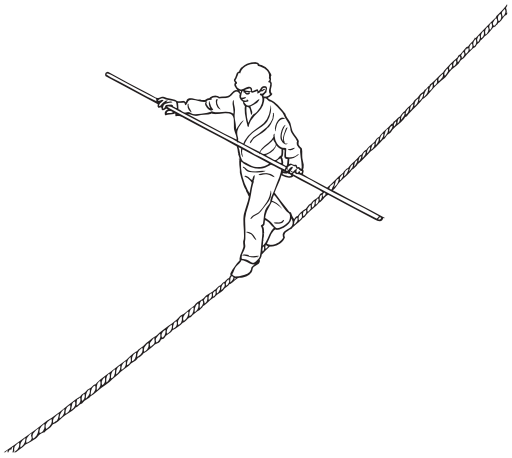
A Pine trees in a dense forest can grow taller than pine trees in an open meadow.

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 —

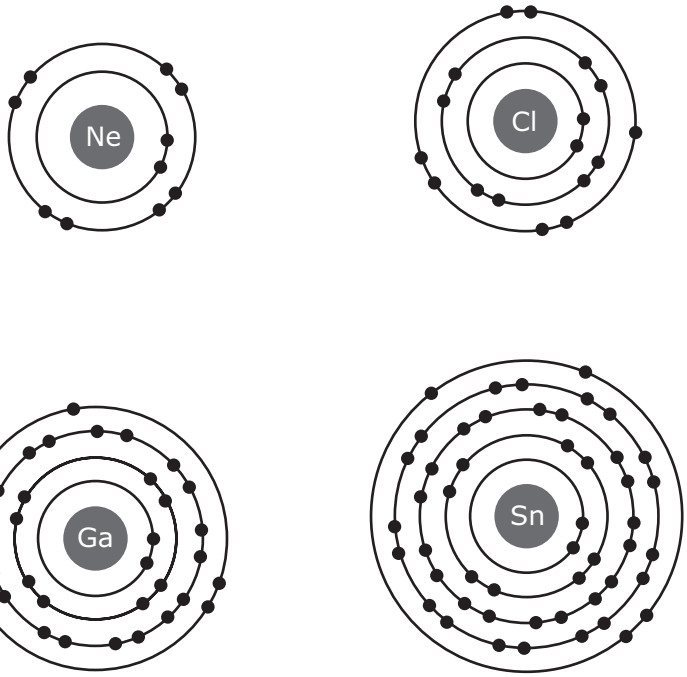
F the aerialist's feet and the rope

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?

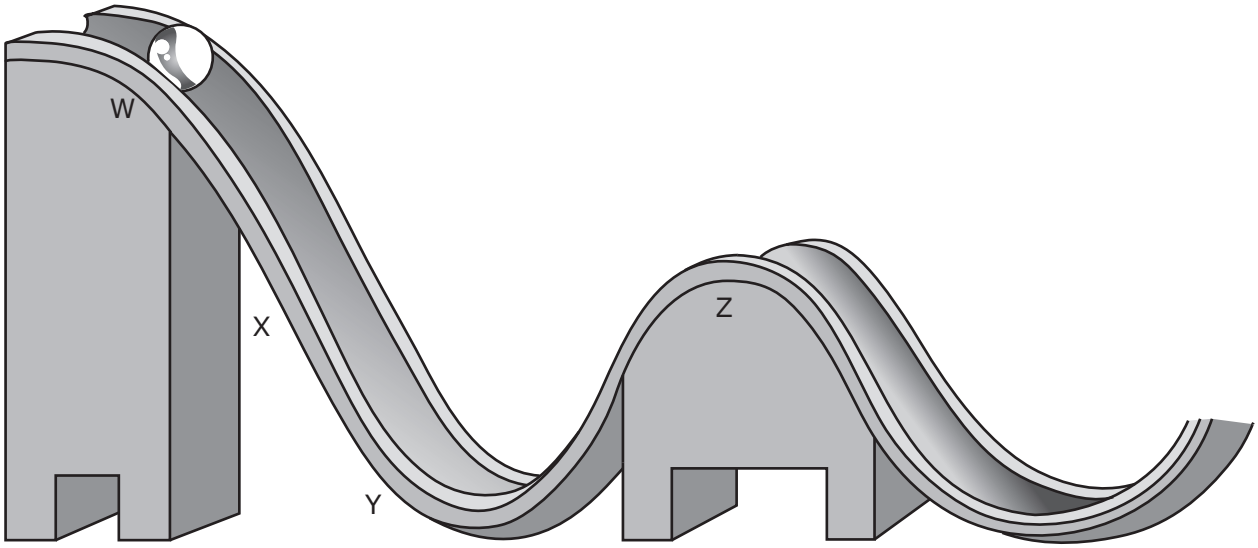
F Silicon is a better conductor of electricity than sulfur.

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?

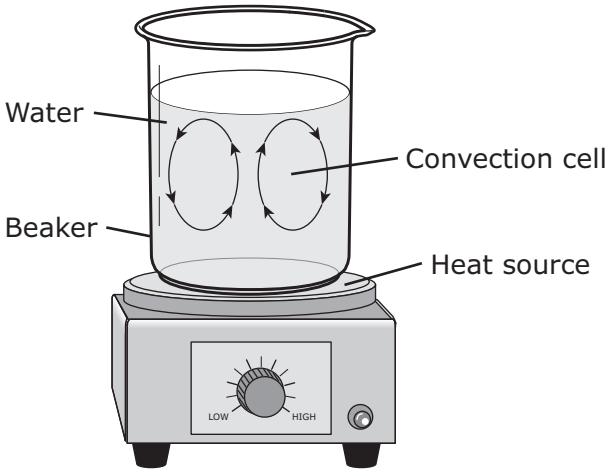
F $2AgNO_3 + K_2SO_4 \longrightarrow Ag_2SO_4 + 2KNO_3$

G $4Fe + 6H_2O + 3O_2 \longrightarrow 4Fe(OH)_3$

H $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

J $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

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?

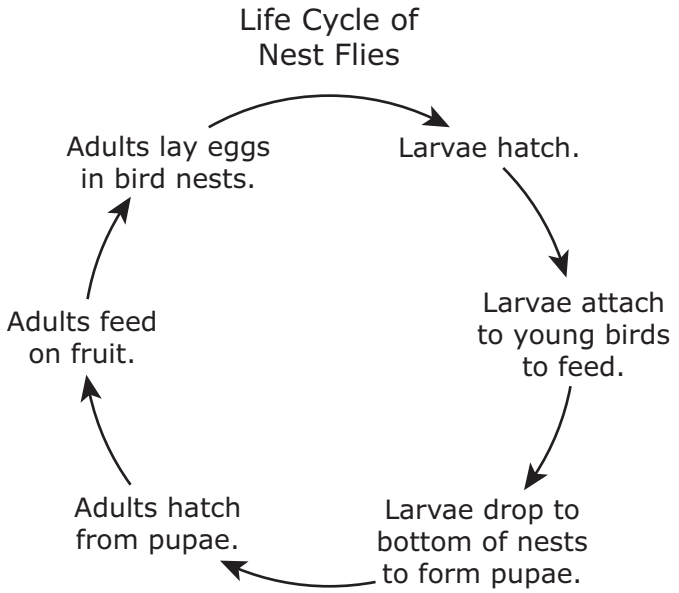
A The warm air in Earth's atmosphere and the warm water in Earth's oceans sink instead of rise.

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

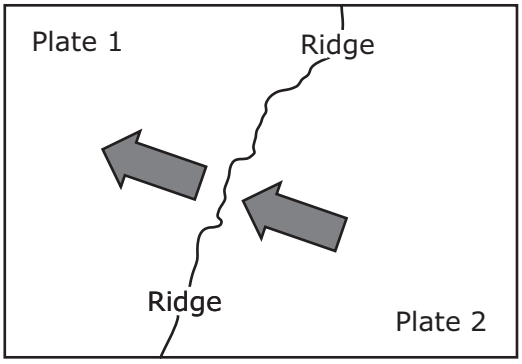
H The box with a mass of 6 kg

J The box with a mass of 8 kg

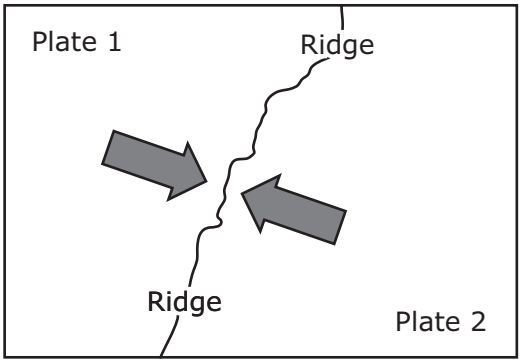
---

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?

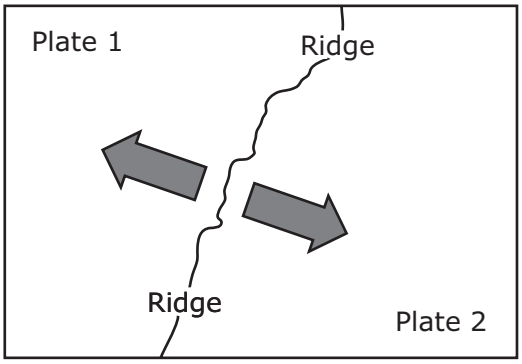
A



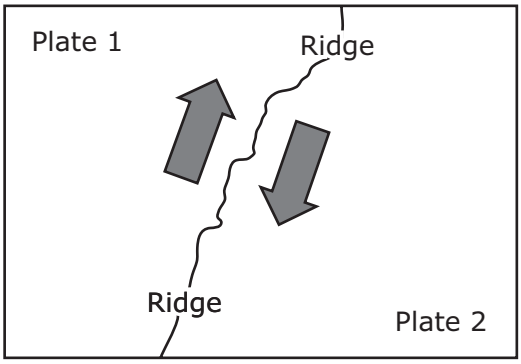
C



B



D



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.

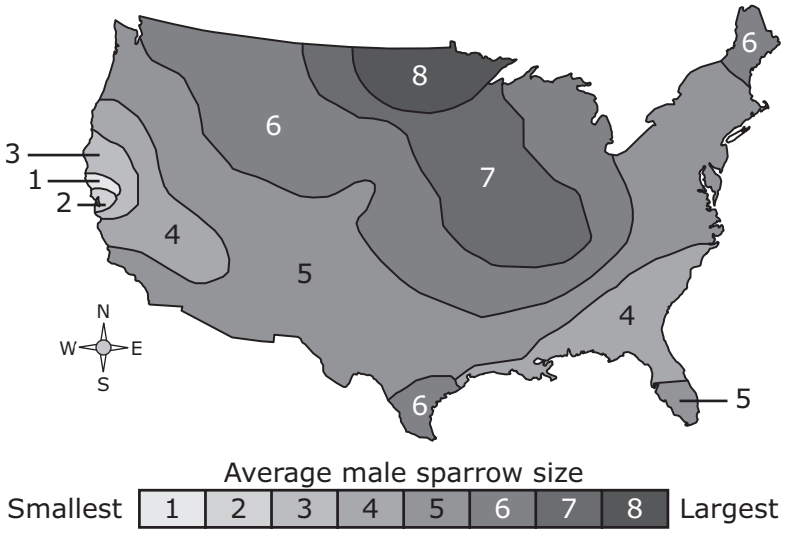
H Procedure 1: The reactants were liquids with different densities.
Procedure 2: The reactants were combined into only one product.

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

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?

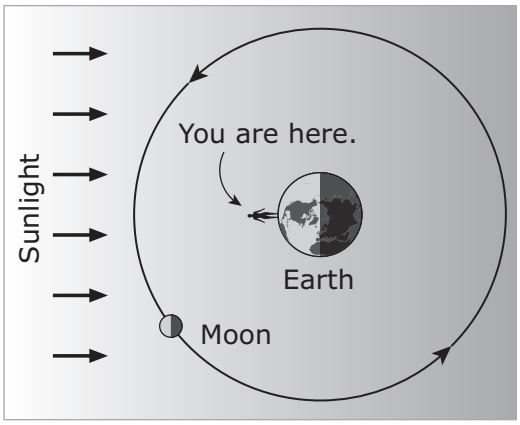
A Cold temperatures in the North favored the survival of populations of larger sparrows over populations of smaller sparrows.

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?

F

Waxing gibbous

H

Waning crescent

G

Waning gibbous

J

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

B

Information About Some Chemical Elements

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

C

Information About Some Chemical Elements

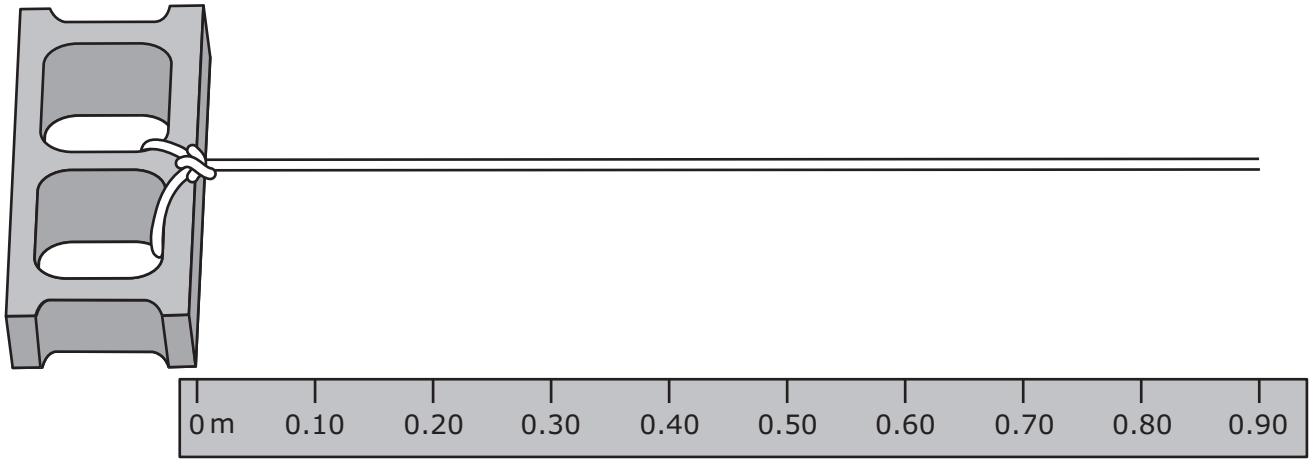
Group	Symbol	Classification
10	Ni	Nonmetal
14	C	Metalloid
2	Mg	Metal
6	Pb	Metal

D

Information About Some Chemical Elements

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

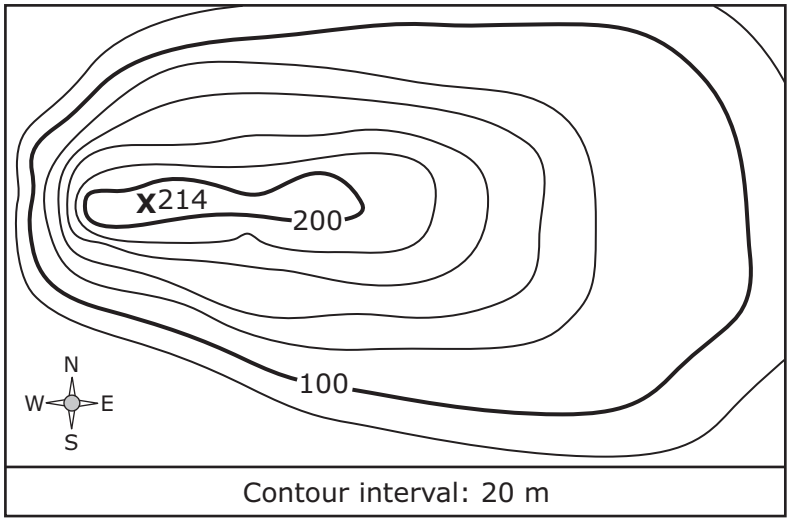
32 A block is pulled 0.90 m to the right in 2.5 s.



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

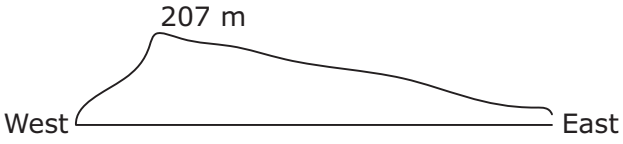
Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

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.

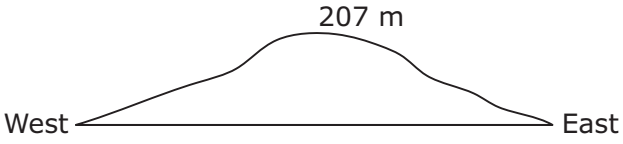


Which profile most likely represents the landscape today?

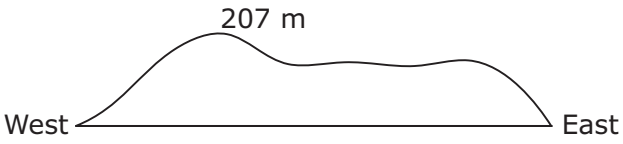
A



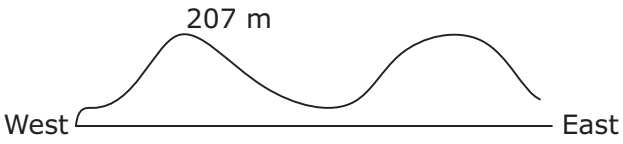
B



C



D



GO ON

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

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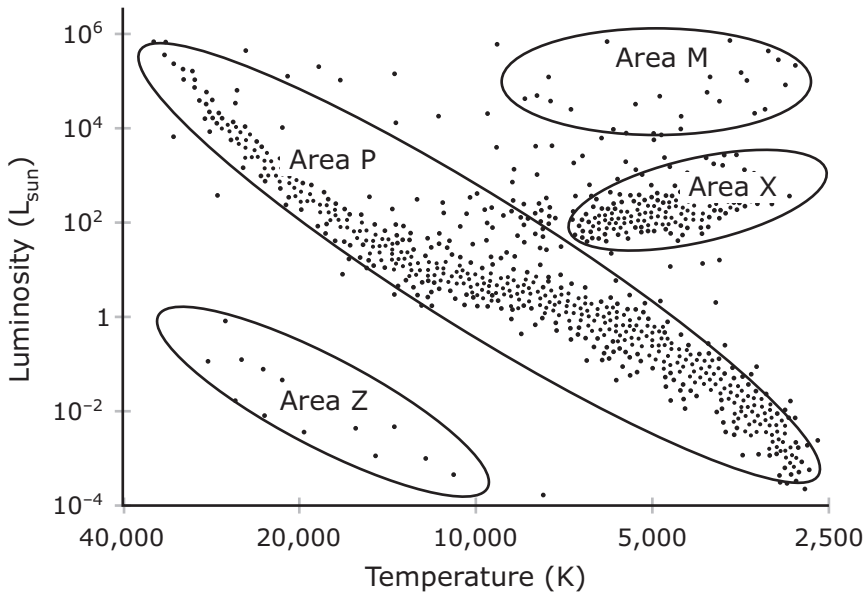
35 Most stars in the universe fit into one of the four areas on this Hertzsprung-Russell diagram.

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?

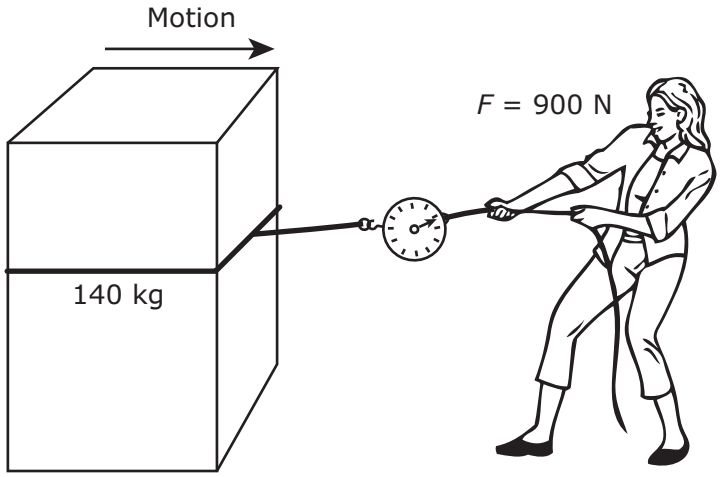
F The muscle contractions result in physical changes, while the action of the peptidase results in chemical changes.

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.



Actual Acceleration of Crate

Trial	Acceleration (m/s^2)
1	0.36
2	0.34
3	0.38
Average	0.36

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

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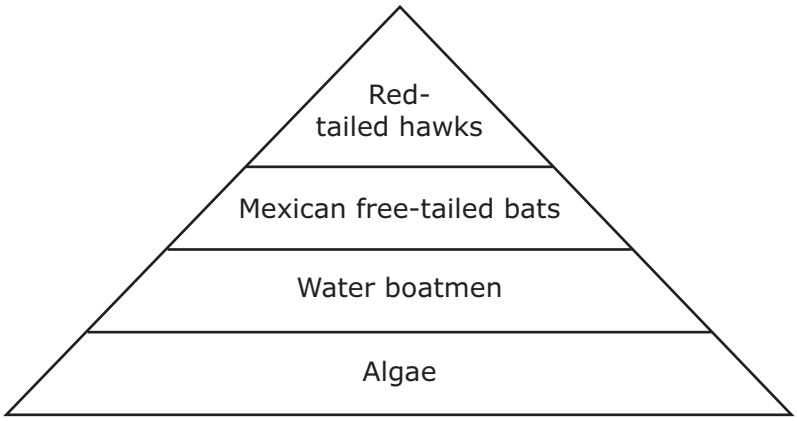
39 An energy pyramid is shown.



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.

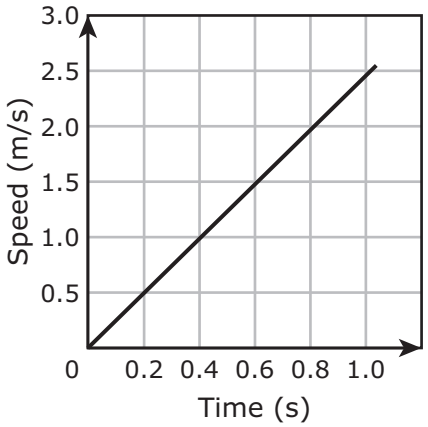
40 Students slid a small wood block along a flat tabletop for a distance of 1.6 m. The data show the motion of the block of wood.

Data for Motion of Wood Block

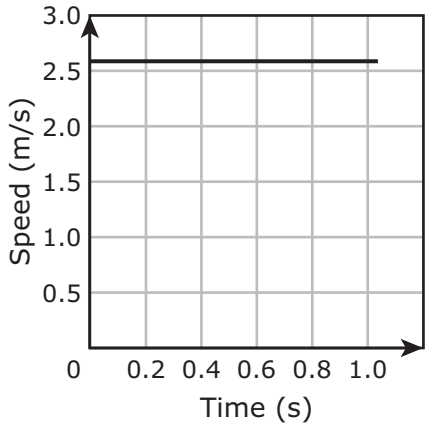
Time (s)	Speed (m/s)
0.0	2.6
0.2	2.2
0.4	1.8
0.6	1.4
0.8	1.0
1.0	0.6

Which graph displays the motion of the wood block?

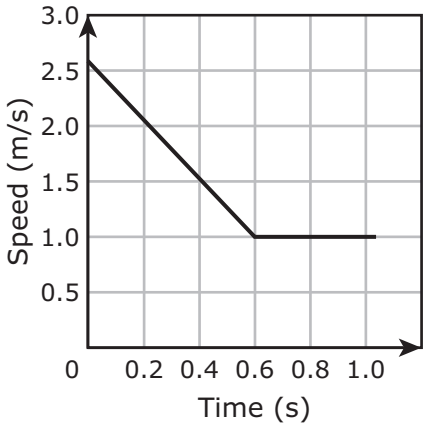
F



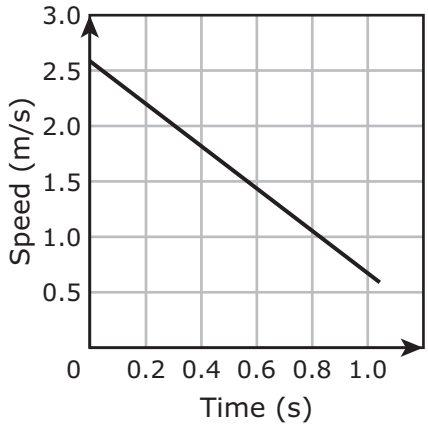
H



G



J



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

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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

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS ON THE ANSWER DOCUMENT.

Item Number	Reporting Category	Readiness or Supporting	Content Student Expectation	Process Student Expectation	Correct Answer
1	4	Readiness	8.11(A)	8.2(E)	D
2	3	Readiness	8.8(A)		F
3	1	Readiness	8.5(E)	8.2(A)	B
4	2	Supporting	6.9(C)		F
5	4	Readiness	8.11(C)		D
6	2	Readiness	8.6(A)	8.2(E)	G
7	3	Readiness	8.7(A)	8.3(B)	D
8	4	Supporting	7.12(B)	8.2(E)	H
9	2	Supporting	7.7(A)	8.2(E)	A
10	4	Supporting	7.10(B)		G
11	1	Readiness	8.5(C)		5
12	3	Readiness	8.9(B)		H
13	4	Readiness	8.11(B)	8.2(E)	B
14	2	Readiness	8.6(C)		F
15	1	Readiness	8.5(B)	8.3(B)	A
16	3	Supporting	8.8(D)	8.2(E)	H
17	4	Readiness	8.11(C)		A
18	1	Readiness	8.5(A)	8.2(E)	J
19	3	Readiness	8.7(B)		A
20	1	Supporting	6.6(A)	8.2(E)	G
21	2	Supporting	6.8(A)		C
22	1	Readiness	8.5(D)		J
23	3	Supporting	8.10(A)	8.3(C)	B
24	4	Readiness	8.11(A)	8.3(B)	H
25	1	Supporting	6.5(C)		A
26	2	Readiness	8.6(C)	8.2(E)	F
27	3	Readiness	8.9(B)	8.3(B)	B
28	1	Readiness	8.5(E)	8.2(B)	J
29	4	Readiness	8.11(C)	8.2(E)	A
30	3	Readiness	8.7(B)	8.3(B)	J
31	1	Readiness	8.5(C)	8.2(E)	B
32	2	Supporting	6.8(C)	8.2(E)	0.36
33	3	Readiness	8.9(C)	8.3(B)	A
34	4	Supporting	8.11(D)		G
35	3	Readiness	8.8(A)		D
36	1	Supporting	7.6(B)		F
37	2	Readiness	8.6(A)	8.2(D)	B
38	4	Supporting	7.11(C)		F
39	1	Supporting	7.5(C)	8.3(B)	C
40	2	Supporting	6.8(D)	8.2(D)	J
41	3	Supporting	6.11(B)		B
42	4	Readiness	8.11(B)		H

2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
1	Option D is correct	Primary consumers eat producers, and secondary consumers eat other consumers. Grasses are producers, and grasshoppers are consumers.
	Option A is incorrect	Badgers are not eating beetles in this food web.
	Option B is incorrect	The lupines are not being consumed by the ants in this food web. Therefore, a producer–consumer relationship cannot exist between lupines and ants.
	Option C is incorrect	The ground squirrels do not eat beetles in this food web. Therefore, a predator–prey relationship cannot exist between beetles and ground squirrels.
2	Option F is correct	Star formation begins in a giant cloud of dust and gas, which is a nebula.
	Option G is incorrect	Unlike what all other star groups do, white dwarfs do not become main-sequence stars when mass is increased. Instead, white dwarfs shrink in size when mass is increased.
	Option H is incorrect	Supergiants are stars that can become black holes. Supergiants are not capable of absorbing black holes.
	Option J is incorrect	Main-sequence stars are formed from protostars, not by comets.
3	Option B is correct	The material that formed was a new substance with properties different from the properties of the metal and the solution, which is an indication that a chemical reaction took place.
	Option A is incorrect	Whether or not a reactant or product is visible does not indicate that a chemical reaction did or did not take place.
	Option C is incorrect	A change in color alone is not evidence that a chemical reaction did or did not take place.
	Option D is incorrect	A change in volume is not evidence that a chemical reaction did or did not take place.
4	Option F is correct	Thermal energy is used to heat the water and is then changed to sound energy as the steam escapes from the tea kettle.
	Option G is incorrect	The energy in the natural gas does not turn directly into sound energy when heating the water. Sound energy does not change into light energy when the tea kettle becomes warm.
	Option H is incorrect	There is no electrical energy in the natural gas. Thermal energy is not transformed into light energy when the steam leaves the tea kettle.
	Option J is incorrect	There is no light energy in the natural gas. The chemical energy in the natural gas does not transform into kinetic energy.
5	Option D is correct	The bacteria that were not killed by the antibiotic passed their genetic information to subsequent generations, resulting in a population of bacteria that was resistant to the antibiotic.
	Option A is incorrect	The bacteria that survived the antibiotic did not stop reproducing. The bacteria continued to reproduce, and that is why the patient got sick again with the same type of infection.
	Option B is incorrect	Changes in temperature related to a high fever are not enough to inactivate the antibiotic.
	Option C is incorrect	Antibiotics are effective at killing bacteria that are not resistant to that particular antibiotic, not just slowing the life cycle.

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2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
6	Option G is correct	The correct answer was obtained by using the formula *Force* = *mass* × *acceleration* to determine the net force acting on the vehicle. 1,100 kilograms × − 1.2 m/s^2 = 1,300 N
	Option F is incorrect	This answer was obtained by adding instead of multiplying. *Force*=*mass*+*acceleration* was used instead of *Force*=*mass*×*acceleration*.
	Option H is incorrect	This answer was obtained by dividing instead of multiplying. *Force*=*mass* / *acceleration* was used instead of *Force* = *mass* × *acceleration*.
	Option J is incorrect	No rearrangement of the formula *Force* = *mass* × *acceleration*. This answer was obtained by dividing 1,000 kg by 9.8, then dividing by -1.2 m/s^2.
7	Option D is correct	Earth's axis is tilted at 23.5 degrees. This tilt results in seasons starting at different months for different parts of the year.
	Option A is incorrect	The changes in seasons are caused by the Earth's tilt, not its orbit.
	Option B is incorrect	The size of the landmass does not affect when seasons start.
	Option C is incorrect	The pull of the moon affects tides, not seasons. Seasons are caused by the Earth's tilt.
8	Option H is correct	Arteries and veins are used to transport nutrients, water, and oxygen to body cells.
	Option F is incorrect	The integumentary system protects vital organs from injury. The system shown is the circulatory system.
	Option G is incorrect	The digestive system chemically breaks down food into smaller pieces. The system shown is the circulatory system.
	Option J is incorrect	The endocrine system produces hormones that regulate growth and metabolism. The system shown is the circulatory system.
9	Option A is correct	In Situation 1, the amount of work done is equal to: *W* = *Fd* = 800 N × 0 m = 0 joules. In Situation 2, the amount of work done is equal to: *W* = *Fd* = 2,000 N × 6.0 m = 12,000 N m = 12,000 J. W = Fd = 2,000 N × 6.0 m = 12,000 N m = 12,000 J.
	Option B is incorrect	The values for Situation 1 and Situation 2 are incorrect. There is no information given in the diagram to support this number.
	Option C is incorrect	In Situation 1, the student obtained the correct answer of 0 J (no work done) by multiplying 800 N by 0 meters. In Situation 2, however, the values are incorrect.
	Option D is incorrect	The values for Situation 1 and Situation 2 are incorrect. There is no information given in the diagram to support this number.
10	Option G is correct	Food webs in areas with a greater variety of species are likely to be more complex, resulting in a more stable ecosystem when natural disasters occur.
	Option F is incorrect	Barren land does not contribute to the sustainability of the ecosystem.
	Option H is incorrect	A narrow transition area between two neighboring ecosystems does not lead to a more sustainable ecosystem.
	Option J is incorrect	Fewer species means less biodiversity.
11	5 and any equivalent values are correct.	On a periodic table, all elements in Group 15 have 5 valence electrons.

2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
12	Option H is correct	Converging plates can lead to uplift and the steep slopes of a mountain range.
	Option F is incorrect	Erosion would not form a mountain range but would result in rounding of the jagged peaks after formation.
	Option G is incorrect	Transform plates that move side by side cause earthquakes that would result in rock being broken apart, not built up into a mountain range.
	Option J is incorrect	Divergent plates would result in an oceanic ridge or rift valley, not the formation of a mountain range.
13	Option B is correct	The data shows that the living branches on the pine trees in the dense forest were near the top of the tree. This indicates that the pine trees in the dense forest had to compete for sunlight with the other plants in that ecosystem.
	Option A is incorrect	The data shows that the pine trees that grew in a dense forest grew just as tall as the pine trees in an open meadow.
	Option C is incorrect	There is no information in the data to support any inference on food webs for either ecosystem.
	Option D is incorrect	The data shows that pine trees in a dense forest have fewer living branches than pine trees in an open meadow.
14	Option F is correct	The aerialist's feet and the rope are in contact with each other. When two objects are in contact with each other, an action-reaction pair of forces exists between these two objects.
	Option G is incorrect	The rope and the balancing bar are not in direct contact with each other. Since they are not in direct contact with each other, an action-reaction pair of forces does not exist between these two objects.
	Option H is incorrect	The two ends of the rope are not in direct contact with each other. Since they are not in direct contact with each other, an action-reaction pair of forces does not exist between these two objects.
	Option J is incorrect	The aerialist's arms and legs are not in direct contact with each other. Since they are not in direct contact with each other, an action-reaction pair of forces does not exist between these two objects.
15	Option A is correct	The outer shell of neon can hold up to eight valance electrons. A full shell means the element is least reactive.
	Option B is incorrect	Since there are only seven valence electrons, the outer shell is not complete, and the element will react with other elements until it obtains eight valence electrons.
	Option C is incorrect	Since there are only three valence electrons, the outer shell is not complete, and the element will react with other elements until it obtains eight valence electrons.
	Option D is incorrect	Since there are only four valence electrons, the outer shell is not complete, and the element will react with other elements until it obtains eight valence electrons.
16	Option H is correct	Sirius A would be approximately at the 21-meter mark. The distances in the model are proportional. Using the proportion for Proxima Centauri (10 m/4.2 ly), multiply to determine the distance for each star.
	Option F is incorrect	Barnard's Star would be approximately at the 14-meter mark.
	Option G is incorrect	Wolf 359 would be approximately at the 18-meter mark.
	Option J is incorrect	Ross 248 would be approximately at the 25-meter mark.
17	Option A is correct	An increase in rainfall will lead to an increase in the producer populations. An increase in the producer populations will, in turn, lead to an increase in the wildebeest population. As a result of the increase in the wildebeest population, the lion and cheetah populations would increase as well.
	Option B is incorrect	The increase in rainfall leads to an increase in grass. More grass means more wildebeests.
	Option C is incorrect	If the wildebeest population increases, the lion and cheetah populations increase as well.
	Option D is incorrect	An increase in rainfall leads to an increase in the grass populations. An increase in the grass populations will, in turn, lead to an increase in the wildebeest population. As a result of the increase in the wildebeest population, the lion and cheetah populations would increase as well.

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2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
18	Option J is correct	The atomic number of zinc is 30. This means that there are 30 protons in the nucleus of a zinc atom. There are also 30 electrons outside the nucleus.
	Option F is incorrect	The atomic number of indium is 49. This means that there are 49 protons in the nucleus of an indium atom. Neutrons are inside the nucleus.
	Option G is incorrect	The atomic number of scandium is 21. This means that there are 21 electrons outside the nucleus of a scandium atom. The mass is 45 and is made up of protons and neutrons. There are 23 neutrons inside the nucleus.
	Option H is incorrect	The atomic number of aluminum is 13. This means that there are 13 protons in the nucleus of an aluminum atom. There are 13 electrons outside the nucleus.
19	Option A is correct	These are the moon phases listed in the correct order.
	Option B is incorrect	The first quarter does not follow a waning gibbous moon; third quarter does.
	Option C is incorrect	The new moon phase does not follow the full moon phase. Waning gibbous follows the full moon phase.
	Option D is incorrect	Waning gibbous follows the full moon phase. Waning crescent also does not follow the new moon phase.
20	Option G is correct	Silicon is a metalloid, and copper is a metal. Since copper is a metal, it conducts electricity better than silicon.
	Option F is incorrect	The statement is true, but the question is asking for an incorrect statement. Silicon is a metalloid, and sulfur is a nonmetal. Therefore, silicon conducts electricity better than sulfur does.
	Option H is incorrect	The statement is true, but the question is asking for an incorrect statement. Silicon is a metalloid that is solid at room temperature, and argon is a noble gas that is a gas at room temperature.
	Option J is incorrect	The statement is true, but the question is asking for an incorrect statement. Silicon is less malleable than silver.
21	Option C is correct	Most of the potential energy has been converted to kinetic energy at Location Y because it is at the lowest part of the track.
	Option A is incorrect	The amount of kinetic energy at Location W is less than at Location X, Location Y, and Location Z because it is above those locations.
	Option B is incorrect	The amount of kinetic energy at Location X is less than at Location Y.
	Option D is incorrect	The amount of kinetic energy at Location Z is less than at Location Y.
22	Option J is correct	The number of oxygen atoms involved in this chemical reaction is six. The six oxygen atoms in $3O_2$ get rearranged as four oxygen atoms in $2CO_2$ and two oxygen atoms in $2H_2O$.
	Option F is incorrect	The number of oxygen atoms in this chemical reaction is ten. The six oxygen atoms in $2AgNO_3$ and the four oxygen atoms in K_2SO_4 get rearranged as four oxygen atoms in Ag_2SO_4 and six oxygen atoms in $2KNO_3$.
	Option G is incorrect	The number of oxygen atoms in this chemical reaction is twelve. The six oxygen atoms in $6H_2O$ and the six oxygen atoms in $3O_2$ get rearranged as twelve oxygen atoms in $4Fe(OH)_3$.
	Option H is incorrect	The number of oxygen atoms involved in the chemical reaction is eighteen. The twelve oxygen atoms in $6CO_2$ and the six oxygen atoms in $6H_2O$ get rearranged as six oxygen atoms in $C_6H_{12}O_6$ and twelve oxygen atoms in $6O_2$.
23	Option B is correct	Earth's atmosphere and oceans receive thermal energy from the sun, not from within Earth.
	Option A is incorrect	Warm air in Earth's atmosphere and warm water in Earth's oceans rise, just as the warm water rises in the model.
	Option C is incorrect	Convection cells in Earth's atmosphere and oceans flow in opposite directions, as shown in the model.
	Option D is incorrect	Cold air in Earth's atmosphere is denser than warm air, and cold water in Earth's oceans is denser than warm water.

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2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
24	Option H is correct	The young birds are providing food to the parasite larvae. Therefore, the young birds are hosts to the larvae.
	Option F is incorrect	The young birds are not hunting and eating the larvae.
	Option G is incorrect	The larvae are not hunting and eating the young birds.
	Option J is incorrect	The young birds are not eating the larvae.
25	Option A is correct	Sulfur hexafluoride is made up of the elements sulfur and fluorine that are chemically bonded to produce a new substance.
	Option B is incorrect	The formula SF_6 indicates that one atom of sulfur is chemically bonded to six atoms of fluorine. Atoms of different elements are not identical.
	Option C is incorrect	Elements are not present in atomic nuclei or outside an atom's nucleus.
	Option D is incorrect	Organic compounds are composed of any combinations of carbon, hydrogen, oxygen, and nitrogen. Compounds that contain sulfur are not considered to be organic.
26	Option F is correct	Newton's second law is *Force* = *mass* × *acceleration*. Therefore, *acceleration* = *Force/mass*, and the smaller the mass, the greater the acceleration. A = 8 N/2 kg = 4 m/s^2
	Option G is incorrect	A box with a mass of 4 kg will experience an acceleration of 2 m/s^2. A = 8 N/4 kg = 2 m/s^2
	Option H is incorrect	A box with a mass of 6 kg will experience an acceleration of 1.34 m/s^2. A = 8 N/6 kg − 1.34 m/s^2
	Option J is incorrect	A box with a mass of 8 kg will experience an acceleration of 1 m/s^2. A = 8 N/8 kg = 1 m/s^2
27	Option B is correct	The plates are moving away from each other. At each side of a mid-ocean ridge, the plates move away from each other.
	Option A is incorrect	The plates are moving in the same direction. At each side of a mid-ocean ridge, the plates move away from each other.
	Option C is incorrect	The plates are moving toward each other. At each side of a mid-ocean ridge, the plates move away from each other.
	Option D is incorrect	The plates are sliding past each other. At each side of a mid-ocean ridge, the plates move away from each other.
28	Option J is correct	A gas escaping is the only way that mass could have decreased in a chemical reaction. An increase in mass could have resulted from a gas that was not part of the reaction combining with one of the reactants.
	Option F is incorrect	If all or most of the liquid evaporated, there would have been a greater decrease in the mass of the products. If a gas was produced and escaped from the reaction, the mass of the products would have been reduced.
	Option G is incorrect	Mass is not converted into thermal energy.
	Option H is incorrect	Differences in densities do not change the mass of the products. Combining the reactants into one product does not change the mass of the product.
29	Option A is correct	The data indicates that larger sparrows are mainly found in the North, where temperatures are cooler.
	Option B is incorrect	The data indicates that smaller sparrows are found in the West.
	Option C is incorrect	The data indicates that larger sparrows are not found in the South.
	Option D is incorrect	The data indicates that larger sparrows are not found along the East Coast.
30	Option J is correct	Following a new moon, from Earth only a small portion of the illuminated side is visible. The moon appears to be waxing, or growing larger.
	Option F is incorrect	The moon appears to be more than one-half but not fully illuminated by direct sunlight. The waxing-gibbous phase is seen after a first-quarter moon.
	Option G is incorrect	The moon appears to be more than one-half but not fully illuminated by direct sunlight. The waning-gibbous phase is seen after the full moon.
	Option H is incorrect	The moon appears to be partly but less than one-half illuminated by direct sunlight. The waning-crescent phase is seen after the third-quarter moon and before a new moon.

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2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
31	Option B is correct	The group, the symbol, and the classification for each element are correct in the table.
	Option A is incorrect	Nitrogen, N, is a nonmetal, and helium, He, is a nonmetal.
	Option C is incorrect	Nickel, Ni, is a metal, and carbon, C, is a nonmetal.
	Option D is incorrect	Sulfur, S, is a nonmetal, and antimony, Sb, is a metalloid.
32	0.36 and any equivalent values are correct	The value 0.36 m/s was obtained by using the formula $S = D/T$ = 0.90 m/2.5 s = 0.36
33	Option A is correct	The close lines west of the highest point represent steep elevation. Contours farther east are farther apart, representing a gentler slope.
	Option B is incorrect	The peak is not centrally located on the hill.
	Option C is incorrect	The map shows that the hill is not flat east of the highest point.
	Option D is incorrect	The map shows that there is not a valley and another hill east of the highest point.
34	Option G is correct	A decrease in the number of fish leads to negative effects for commercial fishermen.
	Option F is incorrect	Water in dead zones is not toxic. It lacks oxygen. This does not affect drilling.
	Option H is incorrect	Dead zones do not affect the course of ocean currents.
	Option J is incorrect	Sand mining is not affected by lack of oxygen in water.
35	Option D is correct	White dwarfs have faint luminosity and very high temperatures, and they are shown on the graph in Area Z.
	Option A is incorrect	Area M represents supergiant stars, which have higher luminosity and cooler temperatures.
	Option B is incorrect	Area X represents giant stars, which have moderate luminosities and high temps.
	Option C is incorrect	Area P represents main-sequence stars, which are much brighter than white dwarfs and have higher temperatures.
36	Option F is correct	Muscle action causes physical changes by breaking apart the food into smaller pieces, and peptidase leads to chemical changes by breaking down the food into simpler compounds that can be absorbed.
	Option G is incorrect	The action of peptidase results in chemical changes.
	Option H is incorrect	Muscle contractions result in physical changes, and the action of peptidase results in chemical changes.
	Option J is incorrect	Muscle contractions result in physical changes, not chemical changes.
37	Option B is correct	The calculated acceleration is $A = F/m$ = 900 N/ 140 kg = 6.42 m/s^2. An opposing force caused by friction led to the lower than expected average acceleration value of 0.36 m/s^2.
	Option A is incorrect	The calculated acceleration is $A = F/m$ = 900 N/ 140 kg = 6.42 m/s^2. Another force in the direction of motion would have increased the acceleration value, not decreased it.
	Option C is incorrect	The calculated acceleration is $A = F/m$ = 900 N/ 140 kg = 6.42 m/s^2. Another force toward the teacher would have caused acceleration greater than 0.36 m/s^2. 0.36 m/s2 is a lower acceleration than 6.42 m/s^2.
	Option D is incorrect	The calculated acceleration is $A = F/m$ = 900 N/ 140 kg = 6.42 m/s^2. The friction force caused the actual acceleration to be less than the expected acceleration. 0.36 m/s^2 is a lower acceleration than 6.42 m/s^2.

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2018 STAAR Grade 8 Science Rationales

Item #	Rationales	
38	Option F is correct	Larger grains were preferred to provide more food per plant for humans.
	Option G is incorrect	Taller stems to block sunlight would not benefit farmers by providing more food.
	Option H is incorrect	Larger flowers were not preferred over larger grains. Farmers did not sell flowers.
	Option J is incorrect	Thinner stems were not preferred for human consumption.
39	Option C is correct	Energy is transferred from the level below to the level above.
	Option A is incorrect	Energy is transferred from the level below to the level above.
	Option B is incorrect	Energy lost at any level does not continue to flow through the energy pyramid.
	Option D is incorrect	The organisms at the bottom level directly provide energy only to organisms in the level above.
40	Option J is correct	This graph shows that the speed of the block is decreasing.
	Option F is incorrect	This graph shows that the speed of the block is increasing.
	Option G is incorrect	This graph shows that the speed of the block decreased, then remained constant.
	Option H is incorrect	This graph shows that the speed of the block is remaining constant, not decreasing.
41	Option B is correct	Gravity is the attractive force that keeps planets in orbit.
	Option A is incorrect	Light energy cannot keep planets from moving in a straight line.
	Option C is incorrect	Inertia cannot keep planets from moving in a straight line.
	Option D is incorrect	Potential energy cannot keep planets from moving in a straight line.
42	Option H is correct	Sharks obtain oxygen from the water that passes through their gills.
	Option F is incorrect	Gills are used for gas exchange, not to control temperature.
	Option G is incorrect	Sharks obtain food by hunting for prey. Gills do not help them get food.
	Option J is incorrect	Gills are used for gas exchange and are not directly used to avoid predators.

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