

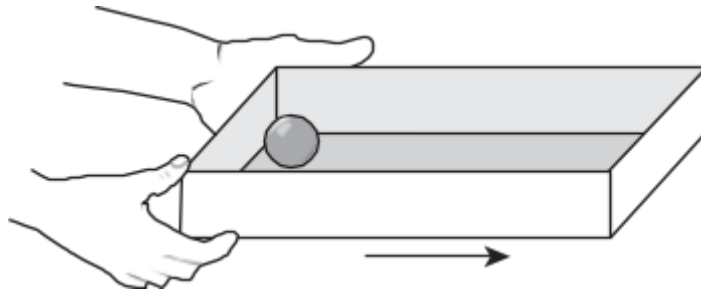
SCIENCE

## 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 Immediately after a forest fire, the primary consumers in the area will compete most for which biotic factor?
- A Food
  - B Space
  - C Oxygen
  - D Sunlight
- 

- 2 A steel ball is at one end of a box that is moving forward as shown. The box suddenly stops.



According to Newton's first law, what happens to the steel ball just after the box stops?

- F Because of friction, the ball continues rolling forward at the same speed.
- G Because of friction, the ball rolls forward at an increased speed.
- H Because of inertia, the ball continues rolling forward at the same speed.
- J Because of inertia, the ball rolls forward at an increased speed.

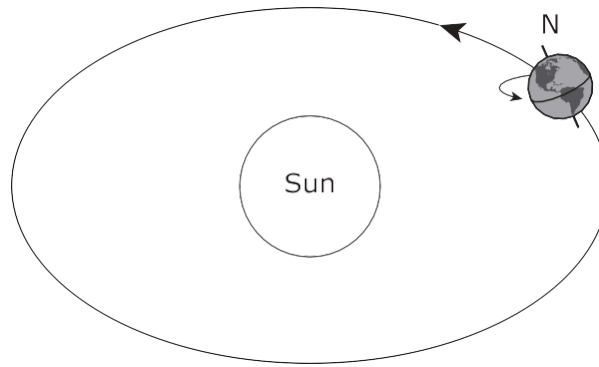
**3** Students mixed two liquids in a beaker and listed their observations.

Observations
Liquid 1 was colorless.
Liquid 2 was colorless.
The mixture of liquids 1 and 2 formed a colorless solution.
Small, solid particles formed and fell to the bottom of the beaker.

Based on these observations, which statement contains the best evidence that a chemical reaction occurred?

- A** There is a change in shape.
- B** There is a change in volume.
- C** The two liquids mix into a solution.
- D** The two liquids form a new substance.

- 4 The diagram shows Earth in its orbit around the sun when very little light is visible at Earth's South Pole.

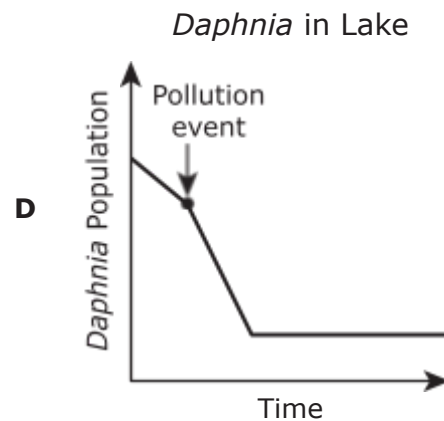
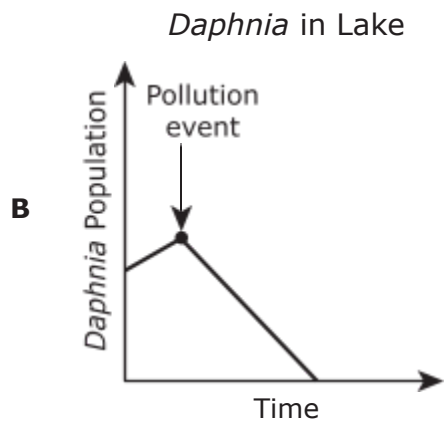
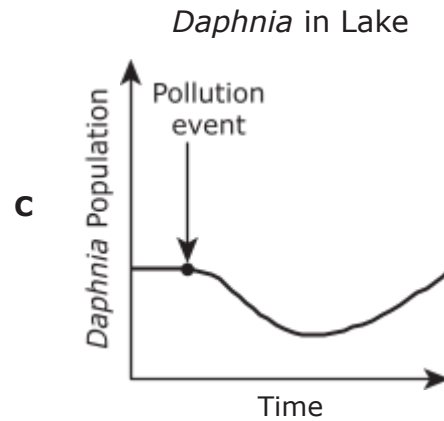
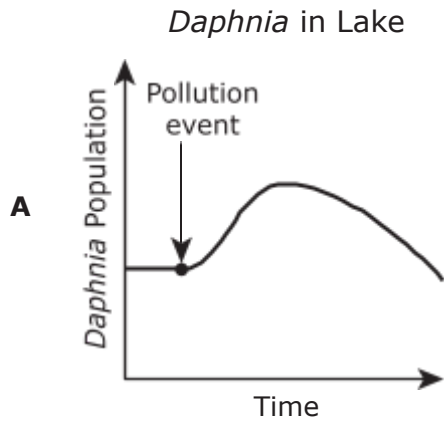


Which statement is true when Earth is in the position shown?

- F** It is August in the Northern Hemisphere.  
It is April in the Southern Hemisphere.
- G** It is summer in the Northern Hemisphere.  
It is winter in the Southern Hemisphere.
- H** The number of hours of daylight is greater in the Southern Hemisphere than in the Northern Hemisphere.
- J** Spring begins earlier in the year in the Southern Hemisphere than it does in the Northern Hemisphere.

- 5 Tiny organisms called *Daphnia* live in lakes and ponds where they consume algae. A lake with a stable population of algae and *Daphnia* was contaminated by pollution, resulting in the death of many algae.

Which graph shows the most likely trend in the *Daphnia* population in the lake shortly before and after the pollution event?

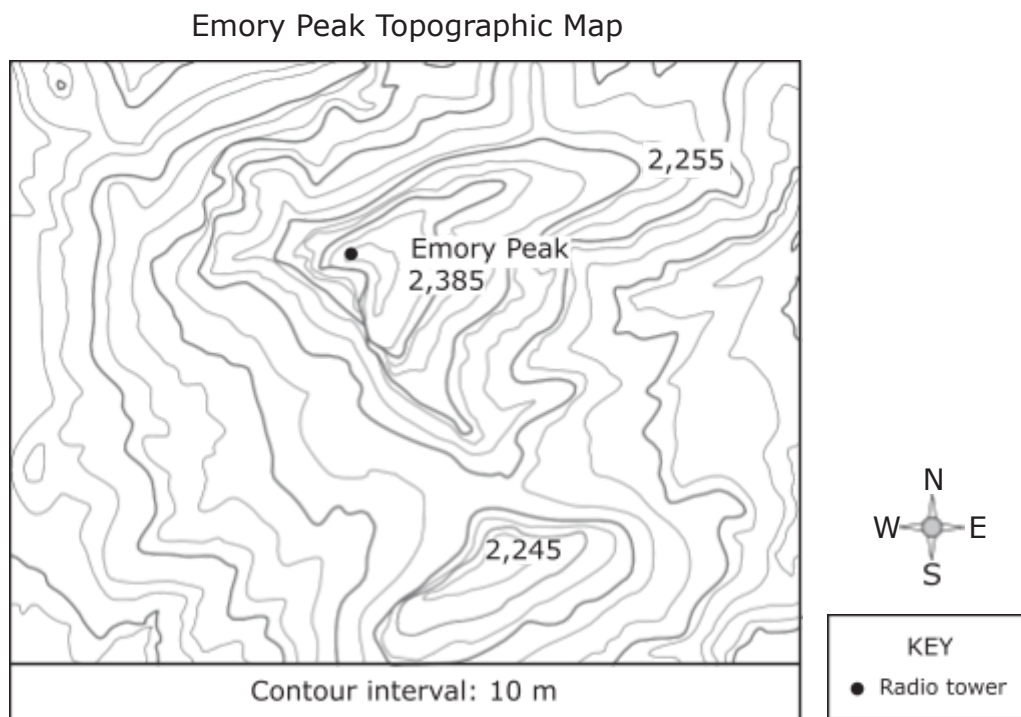


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- 6 A student pushes a 51.5 kilogram bookshelf across a smooth floor with a net force of 67 N.

What is the approximate acceleration of the bookshelf?

- F** 1.3 m/s<sup>2</sup>  
**G** 3,450.5 m/s<sup>2</sup>  
**H** 15.5 m/s<sup>2</sup>  
**J** 0.77 m/s<sup>2</sup>

- 7** A topographic map provides details about Emory Peak in Big Bend National Park. A radio tower on Emory Peak is indicated.



Based on the topographic map, if a park ranger hiked due west from the radio tower, the ranger's path would —

- A** cross a canyon with a river running through it
- B** cross another peak in the park
- C** be flat and then go up a steep slope
- D** go down a steep slope and then become flatter

- 
- 8** Which pair of elements are nonmetals and gases at room temperature and normal atmospheric pressure?

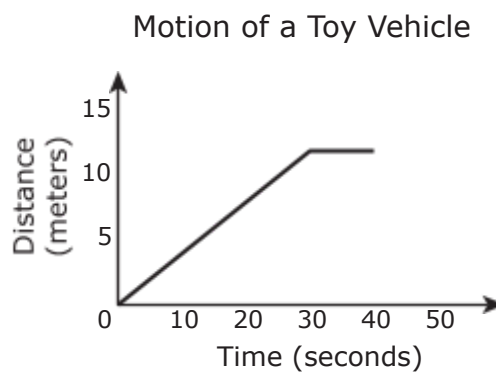
- F** Fluorine, F, and chlorine, Cl
- G** Boron, B, and aluminum, Al
- H** Hydrogen, H, and cesium, Cs
- J** Cobalt, Co, and nickel, Ni

- 9** A farmer digs a small pond in a pasture. The farmer adds young individuals from two species of algae-eating fish to the pond and plants some reeds around the edges of the pond. The farmer wants the pond to be a sustainable ecosystem.

Which of the following would be most helpful in increasing the pond ecosystem's sustainability?

- A** Decreasing the number of plant species around the edges of the pond
  - B** Introducing older fish of the same species into the population of algae-eating fish
  - C** Having a greater diversity of living organisms in the pond
  - D** Adding gravel between the water and where the reeds are planted
- 

- 10** A student investigates the motion of a toy vehicle. The student graphs 40 seconds of data from the investigation.



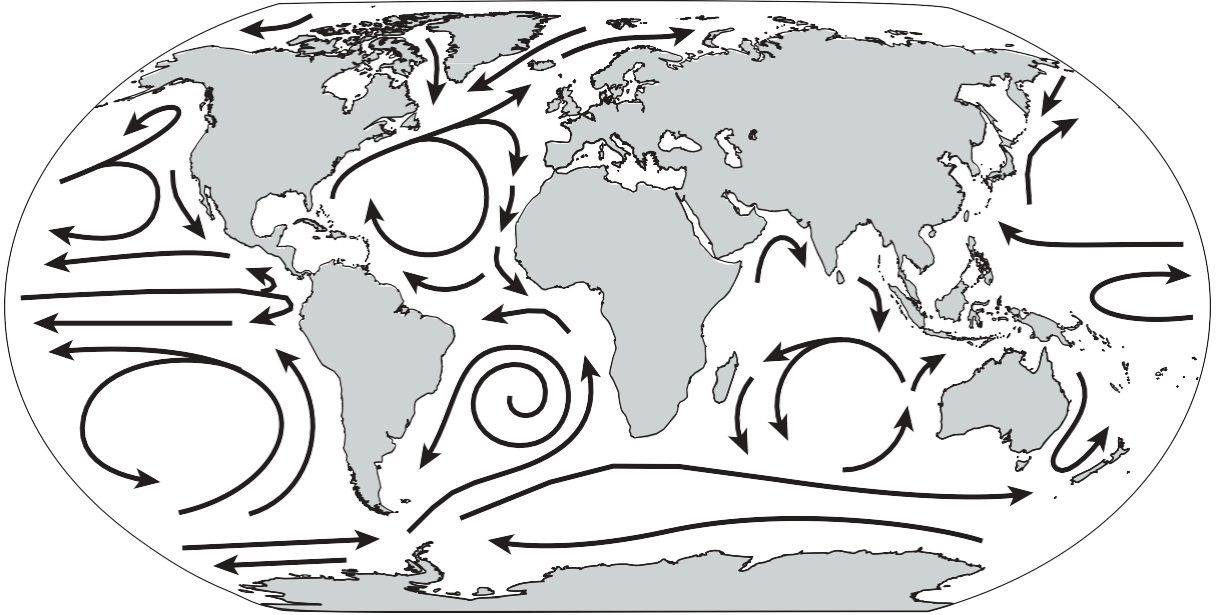
Which statement best describes the motion of the toy vehicle during the first 30 seconds of the investigation?

- F** The vehicle was traveling at a constant speed.
- G** The vehicle was accelerating at a constant rate.
- H** The speed of the vehicle was increasing.
- J** The acceleration of the vehicle was increasing.

**11** How many neutrons are in the nucleus of a potassium atom with a mass number of 39?

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

**12** Major surface currents of the ocean are shown in the diagram.



Ocean currents affect weather patterns by —

- F** regulating when tides occur in coastal areas
- G** trapping heat at the equator to regulate the global climate
- H** distributing heat from the uneven absorption of solar energy
- J** increasing the rate of evaporation to transport water to areas experiencing droughts

**13** Students view two different cells under a microscope. They record their observations in the table shown.

Cell	Organelles Observed
1	Vacuoles Nucleus Cell Membrane
2	Vacuoles Nucleus Chloroplast Cell Wall

Based on the organelles observed, the students determine that cell 2 is a plant cell because it has an organelle that —

- A** allows water to enter and exit the cell
  - B** contains genetic information
  - C** stores water and nutrients
  - D** produces its own food
- 

**14** Which statements correctly compare metals and nonmetals?

- F** Metals tend to be good conductors of thermal energy.  
Nonmetals tend to be good insulators of thermal energy.
- G** Metals are dull and brittle.  
Nonmetals are shiny and malleable.
- H** Metals are good insulators of electricity.  
Nonmetals tend to be good conductors of electricity.
- J** Metals cannot be stretched into thin wires.  
Nonmetals can be stretched into thin wires.

- 15** Roller coasters are popular attractions at amusement parks. A cart on a roller coaster approaches the highest point on the coaster. As the cart reaches the top, it slows down.

Which statement best describes the energy of the roller coaster as it slows down while traveling to the top of the coaster?

- A** The cart gains both kinetic and potential energy.
  - B** The cart gains kinetic energy and loses potential energy.
  - C** The cart loses kinetic energy and gains potential energy.
  - D** The cart loses both kinetic and potential energy.
- 

- 16** Students recorded the dates in May on which they observed a full moon and a last quarter moon.

May

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01	02	03	04 Full	05	06
07	08	09	10	11 Last quarte r	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

On which date will they most likely be able to observe a new moon?

- F** May 13
- G** May 18
- H** May 25
- J** May 31

**17** The names and chemical formulas of four substances are shown in the chart.

Substance Formulas

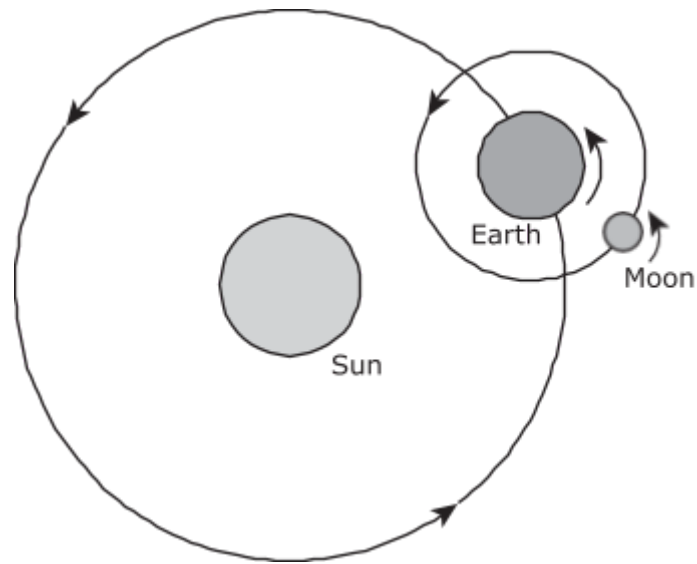
Name	Chemical Formula
Carbonic acid	$\text{H}_2\text{CO}_3$
Nitric acid	$\text{HNO}_3$
Phosphoric acid	$\text{H}_3\text{PO}_4$
Sulfuric acid	$\text{H}_2\text{SO}_4$

Which substance listed in the chart is made up of the most atoms?

- A** Carbonic acid
- B** Nitric acid
- C** Phosphoric acid
- D** Sulfuric acid

**18** An image of the Earth-moon-sun system is shown.

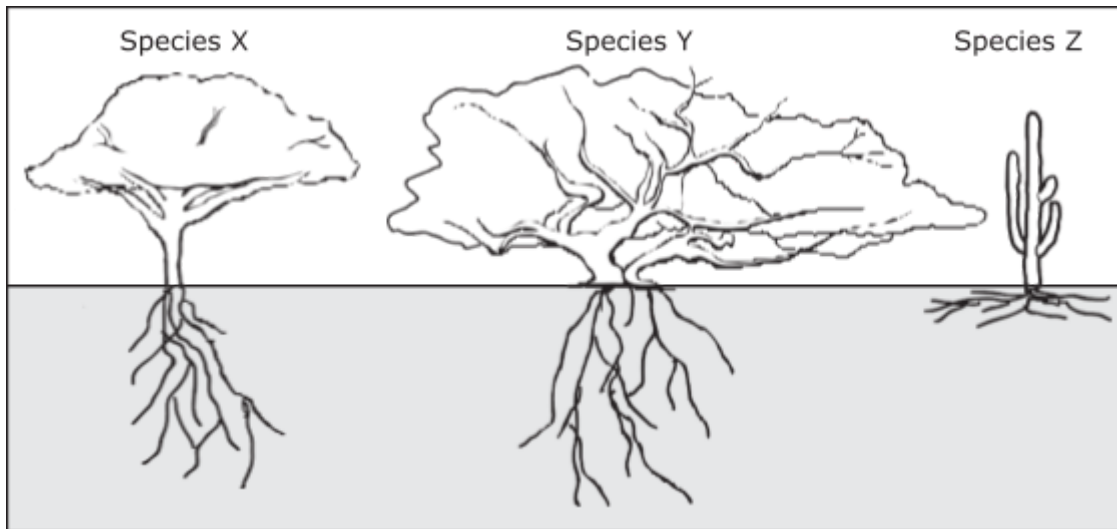
Motion of Earth and Moon



The moon remains in orbit around Earth because of the force of —

- F** Earth's rotation
- G** the moon's rotation
- H** Earth's gravity
- J** the sun's gravity

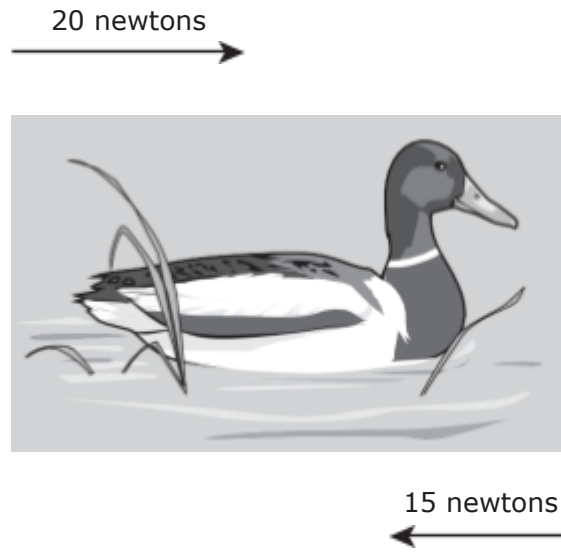
**19** Three different species of plants that live in the desert are shown.



Species Z can successfully share the same environment with the other plants shown because species Z absorbs water —

- A** found deep underground, and species X absorbs water near the soil surface
- B** found deep underground, and species X absorbs water found deep underground
- C** near the soil surface, and species Y absorbs water near the soil surface
- D** near the soil surface, and species Y absorbs water found deep underground

- 20** The diagram shows a duck swimming in a stream in the opposite direction the stream is flowing. The duck pushes against the water, so the water pushes the duck forward with 20 newtons of force. The water also exerts 15 newtons of resistive force against the duck.



Which statement best describes the resulting motion of the duck?

- F** The duck will stop moving.
- G** The duck will stop and then start moving again.
- H** The duck will continue moving in its current direction.
- J** The duck will move in the direction that the stream is flowing.

- 21** A student measures the mass and volume of a small cube made of an unknown metal. The mass of the cube is 25.0 g, and the volume of the cube is 3.19 cm<sup>3</sup>. The student is told that the cube is a sample of one of the four metals listed in the table.

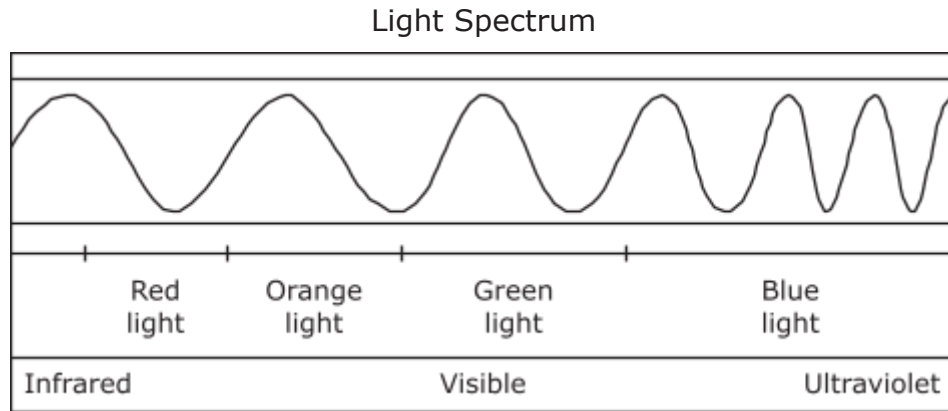
Density of Four Metals

Metal	Density (g/cm <sup>3</sup> )
Gold	19.30
Iron	7.85
Silver	10.50
Tin	7.28

Based on the data given, the unknown metal is most likely —

- A** gold
- B** iron
- C** silver
- D** tin

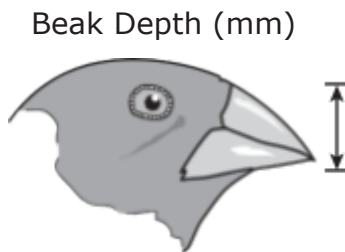
- 22** The temperature of a star determines the wavelength of visible light that is produced. The visible part of the electromagnetic spectrum is shown.



Stars with the highest temperatures will emit most of their light at wavelengths that are near —

- F** red light
- G** orange light
- H** green light
- J** blue light

- 23** There is a range of beak depths in a population of a certain species of seed-eating bird. Scientists observed the feeding behavior of the seed-eating birds and recorded their observations in the table.



Average Beak Depth (millimeters)	Observations
11.0	The birds took 10 seconds to crack open the large seeds.
10.5	The birds took 15 seconds to crack open the large seeds.
8.0 or less	The birds were unable to open the large seeds and ate small seeds instead.

Which statement best predicts the change in subsequent populations of these seed-eating birds if the availability of small seeds decreases?

- A** Birds with a large beak depth will require less food in order to survive and reproduce.
- B** Birds with a large beak depth will have an advantage over birds with a small beak depth and will be better able to survive and reproduce.
- C** Birds with a small beak depth will have an advantage over birds with large beak depths and will be better able to survive and reproduce.
- D** Neither birds with a small beak depth nor birds with a large beak depth will have a reproductive advantage.

**24** Students build a circuit. The circuit has wires that connect a battery to a switch and a fan.

Which energy transformations happen when the students close the circuit and the blades of the fan begin to spin?

- F** Chemical to mechanical to electrical
  - G** Electrical to chemical to mechanical
  - H** Chemical to electrical to mechanical
  - J** Mechanical to electrical to chemical
- 

**25** Students create a table that lists processes observed in nature.

Process	Change
1	Fungus decomposing organic matter
2	Leaves using carbon dioxide to make sugar
3	Plants using nitrogen to make protein
4	Water evaporating from salt water

Which process describes only a physical change?

- A** Process 1
- B** Process 2
- C** Process 3
- D** Process 4

**26** The diagram shows a wildflower and a dichotomous key that can be used to identify the wildflower.



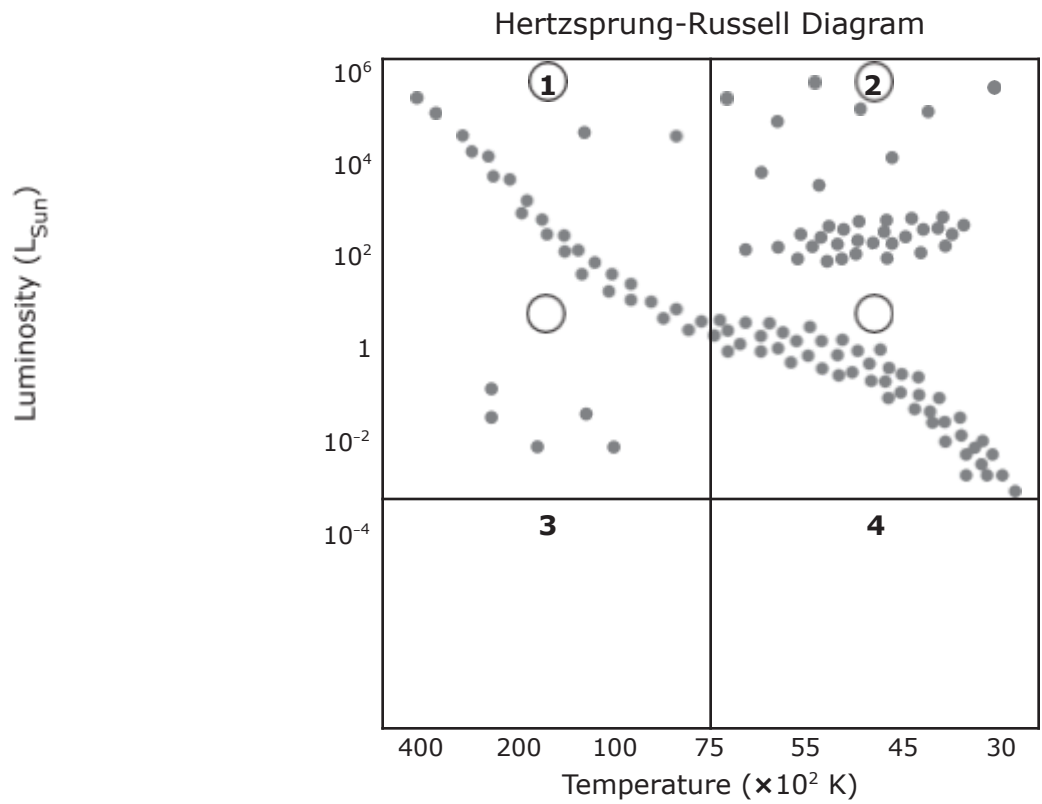
Key to Wildflowers with White Petals

1a	Flower has seven petals.	Starflower
1b	Flower has five petals.	Go to 2
2a	Petals are deeply grooved and divided	Chickweed
2b	Petals appear smooth, in a single piece.	Go to 3
3a	Petals are very long, narrow, and pointed	Bowman's root
3b	Petals are wide and round.	Common strawberry

Based on the key, what is the name of this wildflower?

- F** Starflower
- G** Chickweed
- H** Bowman's root
- J** Common strawberry

**27** The Hertzsprung-Russell diagram shown is divided into four sections.



Which section of the diagram includes the coolest, brightest stars?

- A** Section 1
- B** Section 2
- C** Section 3
- D** Section 4

**28** A skater pushes off a wall and skates backward for a few meters before stopping.

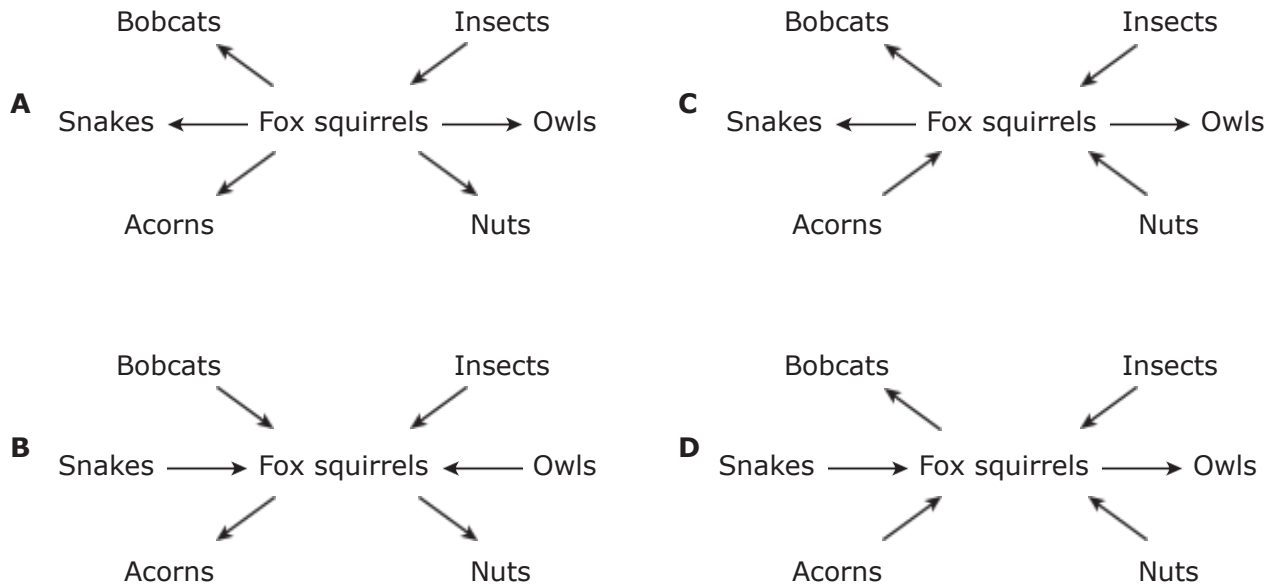


Which statement best describes an action–reaction force pair in this situation?

- F** The wall pushes on the skater when the skater pushes on the wall.
- G** The wheels slow down, and the skater stops.
- H** The skater exerts a force on the wall, and the wheels exert a force on the floor and begin to turn.
- J** The friction of the floor decreases when the wheels roll on the floor.

**29** Fox squirrels are common in Texas. Fox squirrels primarily eat acorns and nuts from trees but also eat insects. Some predators of fox squirrels include owls, snakes, and bobcats.

Which diagram best represents how energy would flow to and from the fox squirrel?

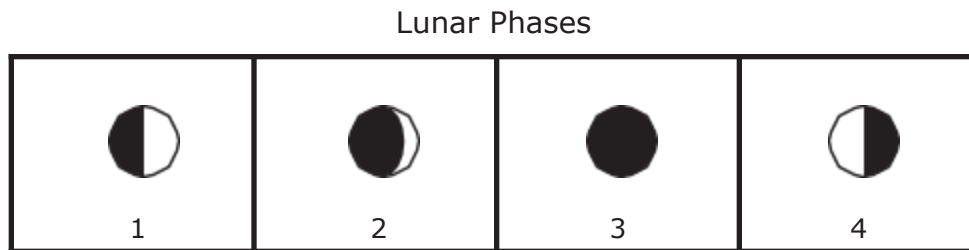


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**30** Which two body systems are primarily responsible for locomotion?

- F** Skeletal system and muscular system
- G** Nervous system and circulatory system
- H** Respiratory system and digestive system
- J** Integumentary system and excretory system

**31** The diagram models four lunar phases.



During which lunar phase is the tide highest?

- A** Phase 1
  - B** Phase 2
  - C** Phase 3
  - D** Phase 4
- 

**32** A horse trainer records the distance a horse travels during three different trials.

Horse's Traveling Times and Distances

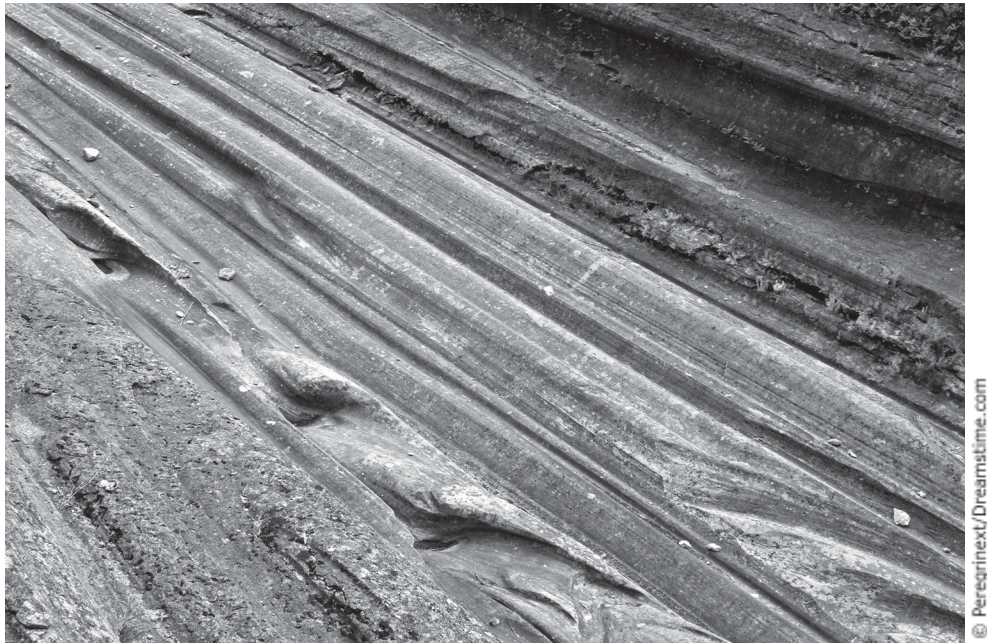
Trial	Time (minutes)	Distance (kilometers)
1	15	4.5
2	30	9.0
3	45	13.5

What is the horse's average speed in kilometers per minute?

**33** Which statement best describes cell theory?

- A** Cells are part of complex organisms that work together to produce new cells.
  - B** Cells perform a single life function, and most cells come from existing cells.
  - C** Cells use energy from food to be able to perform life functions and work together to produce new cells.
  - D** Cells are the basic unit of structure for all organisms, and all cells come from existing cells.
- 

- 34** This picture shows scratches in bedrock that were caused by a moving glacier. These scratches are called glacial striations.



Glacial striations in the bedrock of South Africa indicate that glaciers once moved across the African continent. The presence of glaciers on the surface of Africa is evidence that —

- F** the tectonic plate under Africa was closer to the South Pole at one time
- G** the equator was not always where it is currently located
- H** volcanoes did not exist until after faults occurred in Earth's crust
- J** the location of the North Pole and the South Pole changed

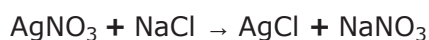
**35** Which pair of elements has reactivity that is similar to chlorine, Cl?

- A** Fluorine, F, and argon, Ar
  - B** Fluorine, F, and iodine, I
  - C** Sulfur, S, and bromine, Br
  - D** Sulfur, S, and argon, Ar
- 

**36** Plants that live on the floors of densely populated forests must compete for sunlight. Which type of leaves are most likely found on plants that are best suited to living on the floor of a dense forest?

- F** Leaves that are needle-shaped
  - G** Leaves that are smallest
  - H** Leaves that store the greatest amount of water
  - J** Leaves with the greatest amount of surface area
- 

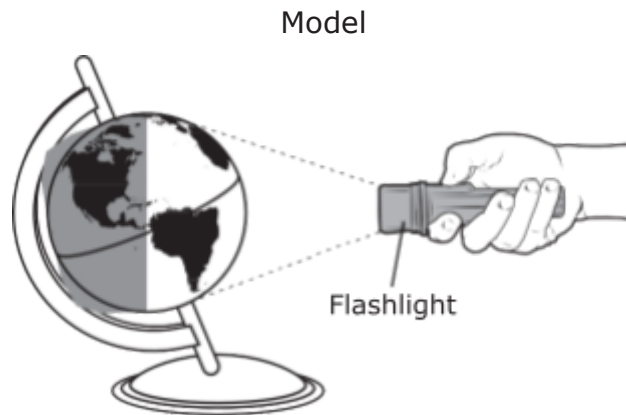
**37** Two solutions are mixed and react to produce the solid precipitate AgCl. The chemical reaction is shown by the balanced chemical equation.



What happens to the total mass as the reaction takes place?

- A** The mass increases.
- B** The mass decreases.
- C** The mass remains constant.
- D** The mass first decreases and then increases.

**38** Students make a model using a globe and a flashlight.



Which answer choice best explains the change from daytime to nighttime on Earth?

- F** The sun stops sending light to Earth at night.
- G** Earth moves farther away from the sun at night.
- H** The tilt of Earth causes less light to reach Earth at night.
- J** Earth rotates and causes different parts of Earth to experience night.

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**39** A toy truck is at rest on the floor. Which statement describes the forces acting on the toy truck?

- A** The forces are balanced so motion occurs.
- B** The forces are balanced so no motion occurs.
- C** The forces are unbalanced so motion occurs.
- D** The forces are unbalanced so no motion occurs.

**40** One of the properties that makes copper, Cu, useful for household wiring is its ability to conduct electricity. Which other element is most likely to conduct electricity?

- F** Gold, Au
  - G** Radon, Rn
  - H** Bromine, Br
  - J** Nitrogen, N
- 

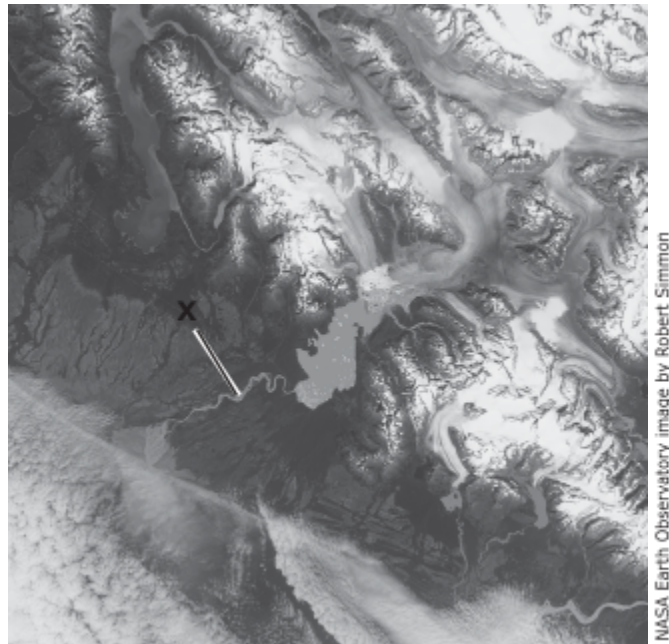
**41** *Parus major* is a bird species that depends on caterpillars as a food source for its young. Caterpillars are most abundant during spring. The yearly increase in temperatures during springtime has gradually shifted, resulting in caterpillars developing approximately two weeks earlier than in the past.

How will the changes in the availability of caterpillars most likely affect future populations of *P. major*?

- A** *P. major* will change their food source to plant leaves.
- B** *P. major* will lay their eggs earlier in the year.
- C** *P. major* will decrease the number of eggs laid at a time.
- D** *P. major* will hunt caterpillars earlier in the day when temperatures are cooler.

**42** The satellite photograph shows geological features, including a glacier.

Satellite Photograph of Glacier



As the glacier melts, water travels toward the ocean along the geological feature labeled X. When water erodes soil along this feature, the feature will most likely become —

- F** straight
- G** dry
- H** shorter
- J** wider