Maryland School Assessment

Science

2009 Public Release

Grade 5

Part 1

Part 1

1 **A fossilized seashell is found on a mountain.**

This seashell shows that the mountain was once

- ○ **A** much hotter
- ○ **B** much colder
- ○ **C** above sea level
- ○ **D** covered by water

Part 1

2 **Maryland air quality is reported daily using the color codes from the data table below.**

AIR QUALITY

Color Code	Condition	Suggested Action
Green	Good	None
Yellow	Moderate	Very sensitive people should limit outdoor exercise.
Orange	Unhealthy for sensitive people	People with trouble breathing should limit being outdoors for long periods.
Red	Unhealthy	Everyone should limit outdoor exercise.

Which group of people would most likely be affected when the color code is yellow?

○ **A** adults who exercise regularly

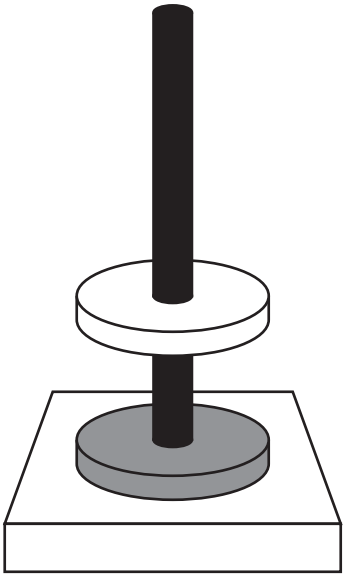
○ **B** athletes in good physical shape

○ **C** teenagers who play soccer and football

○ **D** young children with breathing problems

Part 1

3 **A student places one magnet above another magnet as shown below.**



Why does the top magnet appear to float above the bottom magnet?

- ○ **A** The magnets are made of different material.
- ○ **B** The like poles of the magnets repel each other.
- ○ **C** The opposite poles of the magnets repel each other.
- ○ **D** The magnets have a different gravitational attraction.

Part 1

Directions

Use the information below to answer Numbers 4 and 5.

A teacher conducted an investigation that demonstrated changes in matter. Three beakers were used in the investigation. Each empty beaker had a mass of 400 grams. Beaker W and Beaker X each contained 25 grams of sugar. Beaker Z contained 500 milliliters of water at 60° Celsius.

Beaker W Beaker X Beaker Z

The teacher poured the sugar from Beaker W into Beaker Z. The teacher stirred the sugar and water until the sugar was not visible.

Next, the teacher slowly heated the sugar in Beaker X on a hot plate. Within a few minutes, the sugar melted. The melted sugar turned brown and began to smoke. Finally, the melted sugar turned black and became a solid.

Part 1

4 **The volume of the solid sugar in Beaker W and Beaker X was equal.**

Which statement best explains this equal volume?

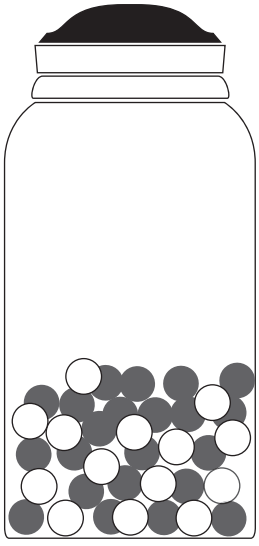
- ○ **A** The same amount of the solid sugar occupies the same amount of space.
- ○ **B** Dividing a sample of the solid sugar increases the amount of the solid sugar.
- ○ **C** The amount of matter in the solid sugar stays the same but the space the solid sugar occupies changes.
- ○ **D** The same amount of space may be occupied by different amounts of the same type of solid sugar.

5 **What property of the water most likely changed after the teacher added the sugar?**

- ○ **A** color
- ○ **B** flavor
- ○ **C** hardness
- ○ **D** odor

Part 1

6 **The mass of a jar and lid with white marbles and black marbles is 1,500 grams. The mass of the marbles alone is $\frac{1}{2}$ the total mass of the jar, lid, and marbles.**



Which statement best explains the difference between the mass of the jar with the marbles and the total mass of only the marbles?

- ○ **A** The mass of the jar and lid is equal to the mass of the marbles alone.
- ○ **B** The mass of the jar and lid is equal to the mass of the white marbles.
- ○ **C** The mass of the white marbles is less than the mass of the black marbles.
- ○ **D** The mass of the white marbles is more than the mass of the black marbles.

Part 1

Directions

Use the passage below to answer Numbers 7 through 9.

Making Fresh Water from Salt Water

Although most water on Earth is salt water, humans can only live by drinking fresh water. Fresh water can be produced from salt water by separating the salt from the water.

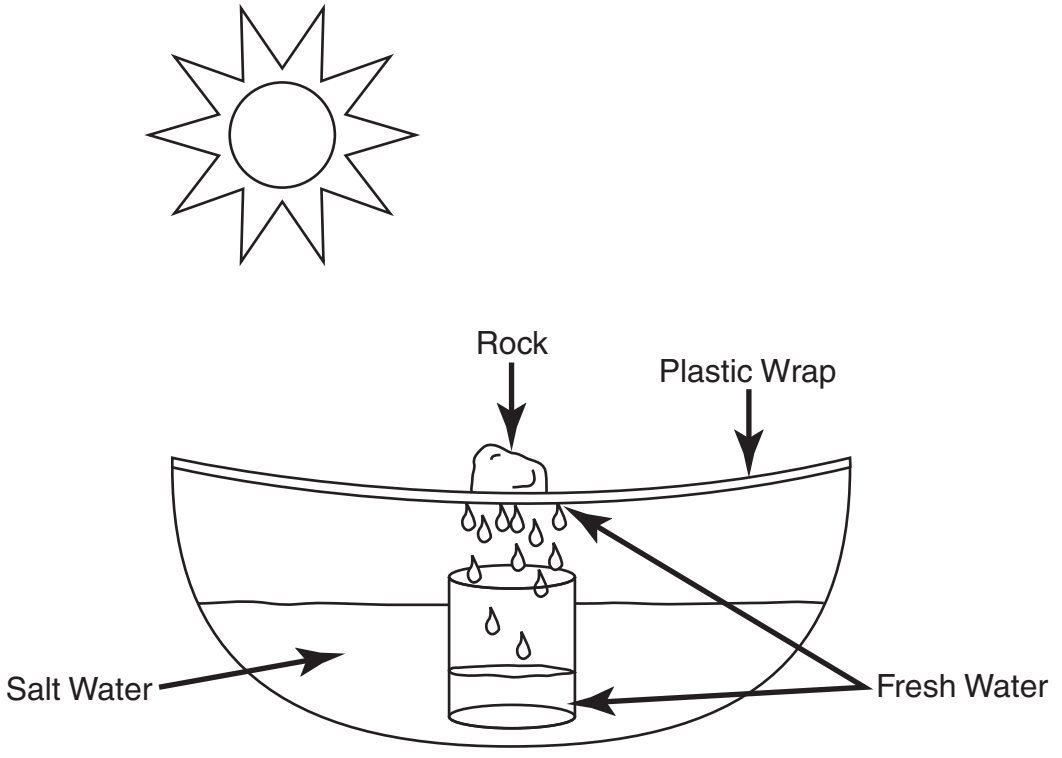
One method of separating salt from water is distillation. During distillation, salt water is heated until the liquid changes to a vapor, or gas. When the water turns to a vapor, the salt is left behind. When the vapor cools and changes to a liquid, it is fresh water.

The steps for making a simple distillation device are described below:

1. Pour salt water in a bowl.
2. Place an empty cup upright in the middle of the bowl of salt water.
3. Cover the bowl and cup with plastic wrap.
4. Place a small rock on the plastic wrap directly over the cup so the plastic wrap is pushed down slightly.
5. Place the bowl in a sunny location.

Part 1

The distillation device is pictured below:



Sunlight causes water to evaporate. The vapor collects in droplets on the inside of the plastic wrap and rolls toward the lowest part of the plastic wrap, where the rock pushes it down. The droplets drip into the cup, filling it with fresh water. The salt stays in the bowl.

Part 1

7 **The teacher gives a student permission to taste the salt water before the distillation, and again, after several hours of distillation. The student notices that the salt water tastes saltier after several hours.**

Which statement best explains this observation?

- ○ **A** The heat from the sun increased the flavor of the salt.
- ○ **B** The light from the sun turned some of the water into salt.
- ○ **C** The mass of salt increased to replace the lost water mass.
- ○ **D** The same amount of salt was present in a smaller volume of water.

Part 1

8 **Five students distilled equal masses of salt water in identical distillation devices. After several hours, the students measured a different amount of fresh water in each of the cups.**

What is the best explanation for the different amounts of water in each of the cups?

- ○ **A** Equal amounts of salt were present in the water.
- ○ **B** Some of the distillation devices were in the shade.
- ○ **C** Each student timed the distillation process differently.
- ○ **D** Each student measured the temperature of the water incorrectly.

Part 1

9 **A student repeated the distillation investigation but forgot to put the rock on the plastic wrap.**

Describe the most likely result of this investigation. In your description, be sure to include

- **the purpose of the rock**
- **how the results of this investigation compare with those of the original distillation**

Part 1

Write your answer in the space provided.

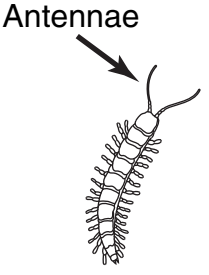
GO ON

Part 1

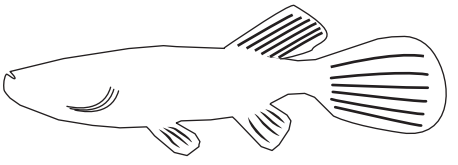
Directions

Use the information and diagram below to answer Numbers 10 and 11.

A troglobite is any animal that lives in dark caves. These animals have special features that help them live in cool, dark places, like the caves in western Maryland. Many cave millipedes, a type of troglobite, have long antennae that feel vibrations. Northern cave fish, another troglobite, have very little skin coloring and cannot see. Animals in caves eat bat waste, material from dead plants, and animals that wash into the cave.



Cave Millipede



Cave Fish

Part 1

10 **Which feature of a cave millipede helps it find food?**

- ○ **A** antennae
- ○ **B** eyes
- ○ **C** legs
- ○ **D** wings

11 **A population of troglobite cave fish is moved from a cave habitat to an open-air pond.**

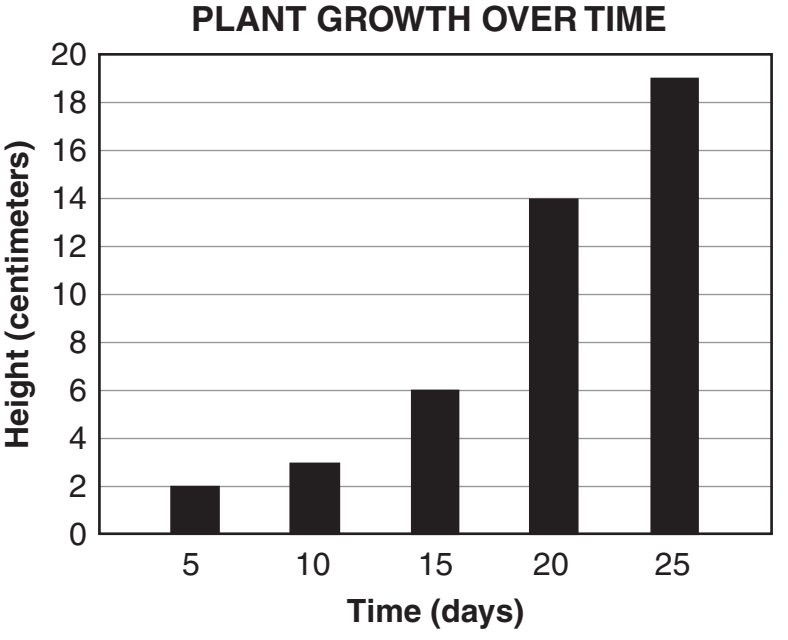
The cave-fish population in the open-air pond will <u>most likely</u>

- ○ **A** increase because their food supply increased
- ○ **B** decrease because they are too large to live in a pond
- ○ **C** increase because their reproduction rate will increase
- ○ **D** decrease because they do not have features needed to survive in sunlight

Part 2

Part 2

12 **Students measured the change in height of a plant during a 25-day period. The graph below shows their data.**

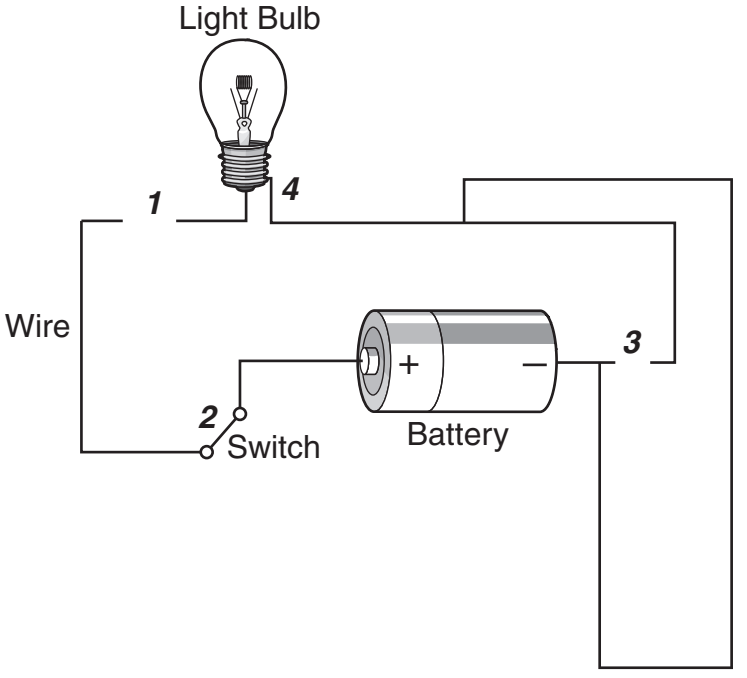


How many centimeters did the plant grow from Day 10 to Day 25?

- ○ **A** 3 centimeters
- ○ **B** 8 centimeters
- ○ **C** 16 centimeters
- ○ **D** 19 centimeters

Part 2

13 **A circuit made of wires, a light bulb, a switch, and a battery is shown below.**



What change is needed for the light bulb to glow?

- ○ **A** Point ***2*** needs the switch opened.
- ○ **B** Point ***1*** needs a connection across the space.
- ○ **C** Point ***3*** needs a connection across the space.
- ○ **D** Point ***4*** needs to connect the wire to the bottom of the bulb.

Part 2

14 **A student wants to compare the amount of matter in a scoop of frozen ice cream to that of a scoop of melted ice cream.**

Explain how the student might make this comparison. In your explanation, be sure to include

- **the equipment needed**
- **the likely outcome of the comparison**

Part 2

Write your answer in the space provided.

Part 2

Directions

Use the information below to answer Numbers 15 and 16.

Students visited the Morris W. Offit telescope located at the Maryland Space Grant Observatory in Baltimore. They learned about the stars, planets, and moon.

The students recorded the information below.

- **Star patterns stay the same, but their locations in the sky seem to change.**
- **The sun, planets, and moon appear to move in the sky.**
- **Proxima Centauri is the nearest star to our solar system.**
- **Polaris is a star that is part of a pattern of stars called the Little Dipper.**

Part 2

15 **The apparent change in the location of a star pattern is related to**

- ○ **A** sun flares
- ○ **B** the season
- ○ **C** the weather
- ○ **D** moon phases

16 **Which statement best explains why the sun appears to move across the sky each day?**

- ○ **A** The sun revolves around Earth.
- ○ **B** Earth rotates around the sun.
- ○ **C** The sun revolves on its axis.
- ○ **D** Earth rotates on its axis.

Part 2

17 **A student mixed salt and sugar.**

Which statement describes the physical properties of salt and sugar after they were mixed?

- ○ **A** The sugar dissolved the salt.
- ○ **B** The salt and sugar changed color.
- ○ **C** The sugar and the salt were unchanged.
- ○ **D** The salt and sugar formed a new material.

Part 2

18 **Scientists group animals based on physical features.**

Trout are classified as fish because of what physical feature?

- ○ **A** Fish have gills.
- ○ **B** Fish eat the same food.
- ○ **C** Fish live in the same area.
- ○ **D** Fish have the same predators.

Part 2

Directions

Use the information below to answer Numbers 19 and 20.

All natural resources on Earth are either renewable or nonrenewable. Whether a resource is renewable or nonrenewable depends on how fast or slow the resource is replaced. If the resource is used faster than it is replaced, then the resource will, in time, disappear.

19 **Which statement describes the use of a renewable natural resource?**

- ○ **A** A home burns natural gas for heat.
- ○ **B** A city burns coal to generate electricity.
- ○ **C** A farmer plants different types of crops to protect the soil.
- ○ **D** A construction crew builds a road from rock, sand, and gravel.

20 **Which activity shows the use of a nonrenewable natural resource?**

- ○ **A** A group of people swims in a river.
- ○ **B** A construction crew builds an iron bridge.
- ○ **C** A farmer grows vegetables to sell at a local market.
- ○ **D** A person bakes a cake with electricity produced by a hydroelectric power plant.

Part 2

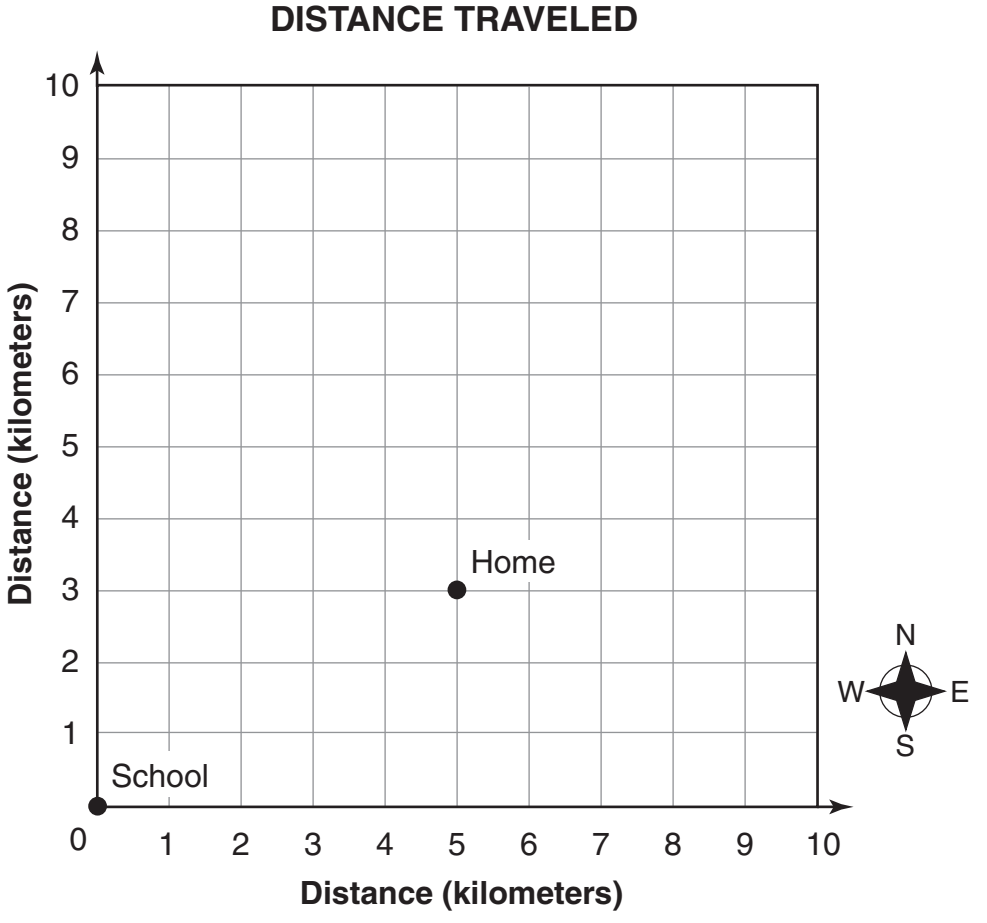
21 **Some schools have programs to recycle paper products such as student papers, newspapers, and cardboard boxes.**

Which of these statements describes a positive effect of recycling paper products?

- ○ **A** Schools need to buy less paper.
- ○ **B** Fewer trees need to be cut.
- ○ **C** Landfills have less room for other trash.
- ○ **D** Recycling consumes more energy than making new paper.

Part 2

22 **A student travels in a car from home to school. The locations of the student's home and the school are shown on the map below.**



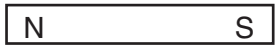
How far and in what direction does the student travel from home to school?

- ○ **A** 3 kilometers north and 7 kilometers east
- ○ **B** 5 kilometers north and 3 kilometers east
- ○ **C** 3 kilometers south and 5 kilometers west
- ○ **D** 5 kilometers south and 7 kilometers west

Part 2

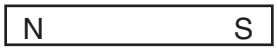
23 **The drawing below is of three separate bar magnets. The north and south poles of each magnet are labeled.**

Magnet X



Magnet Y

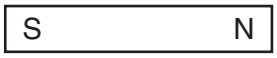
Magnet Z



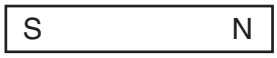
Which arrangement shows that the three magnets would attract one another, end to end?

○ **A**

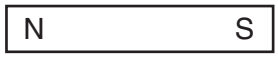
Magnet X



Magnet Y

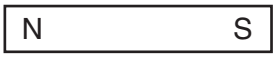


Magnet Z

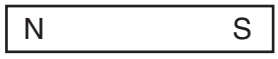


○ **B**

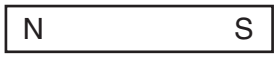
Magnet X



Magnet Y

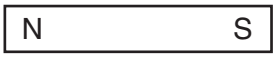


Magnet Z

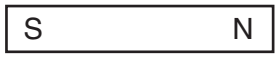


○ **C**

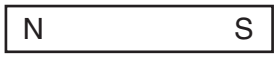
Magnet X



Magnet Y

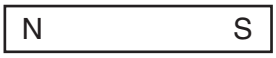


Magnet Z

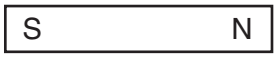


○ **D**

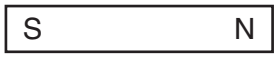
Magnet X



Magnet Y



Magnet Z



Part 3

Part 3

24 **A leaf is covered in mud during a landslide.**

After one million years, this leaf will <u>most likely</u> be

- ○ **A** a fossil
- ○ **B** an animal species
- ○ **C** a new plant species
- ○ **D** a nonrenewable fuel

25 **Baking soda mixed with vinegar produces carbon dioxide and water.**

The best way to prove that no mass was lost during this reaction is to

- ○ **A** use equal masses of baking soda and vinegar
- ○ **B** determine the masses of all the substances before and after the reaction
- ○ **C** determine the mass of the carbon dioxide and water that is produced
- ○ **D** compare the mass of the vinegar and water to be certain they are equal

Part 3

Directions

Use the information below to answer Numbers 26 and 27.

Homes that are built to be environmentally friendly because they use energy more efficiently than other homes are called "green" homes. "Green" homes often have reflective roofs and walls made of recycled materials. The windows in these energy-saving homes are double-paned, meaning each window has two pieces of glass. Double-paned windows have a layer of air between the window panes. This layer is a barrier against extreme temperatures and saves energy.

26 **A solar panel on a "green" home uses**

- ○ **A** chemical energy
- ○ **B** mechanical energy
- ○ **C** a renewable energy source
- ○ **D** a nonrenewable energy source

27 **Which action uses a renewable natural resource?**

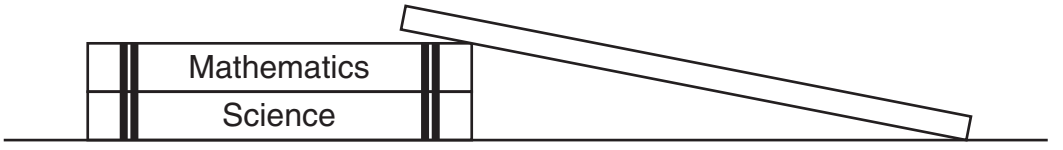
- ○ **A** using steel beams to support a house
- ○ **B** using wood chips to decorate a garden
- ○ **C** using copper pipes to bring water to a house
- ○ **D** using plastic over windows to keep out cold air

Part 3

Directions

Use the information below to answer Numbers 28 and 29.

Students used two textbooks and a board to make a ramp. The students rolled Ball 1 down the ramp. They measured the distance the ball traveled in 10 seconds. The students repeated the investigation, using Ball 2. The students calculated the average speed of each ball after five trials and recorded the information in the data table below.



DATA AFTER FIVE TRIALS

Ball	1	2
Mass (grams)	5	10
Average Distance (centimeters)	25	30
Time (seconds)	10	10
Average Speed (centimeters per second)	2.5	3.0

Part 3

28 **Which of these tools should students use to find the distance each ball rolled?**

- ○ **A** a balance
- ○ **B** a hand lens
- ○ **C** a stopwatch
- ○ **D** a metric ruler

29 **Which of the following statements best compares the balls in the investigation?**

- ○ **A** Ball 2 traveled slower than Ball 1.
- ○ **B** Ball 2 traveled farther than Ball 1.
- ○ **C** Ball 1 had more mass than Ball 2.
- ○ **D** Ball 1 rolled more seconds than Ball 2.

Part 3

30 **Stars are organized into patterns called constellations. One constellation is named Leo.**

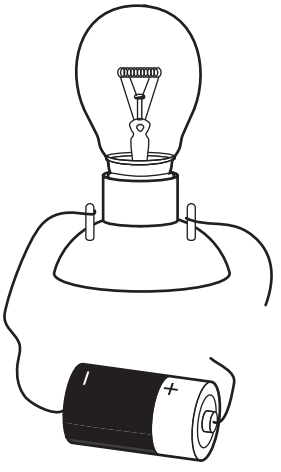
Which statement best explains why Leo appears in different areas of the sky throughout the year?

- ○ **A** Earth revolves around the sun.
- ○ **B** The sun revolves around Earth.
- ○ **C** The constellations revolve around Earth.
- ○ **D** Earth revolves around the constellations.

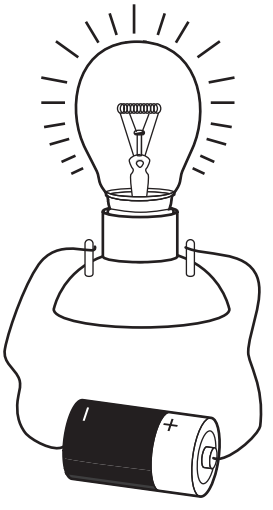
Part 3

31 **Two circuits are shown below. The light bulb of Circuit 1 does not glow. The light bulb of Circuit 2 glows.**

Circuit 1



Circuit 2

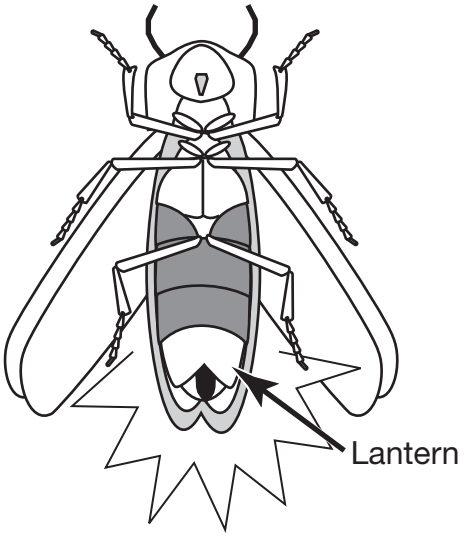


Which statement <u>best</u> explains why the light bulb of Circuit 1 does not glow?

- ○ **A** Circuit 1 is an open circuit.
- ○ **B** Circuit 1 is a closed circuit.
- ○ **C** The positive terminal of Circuit 1 is connected to the battery.
- ○ **D** The negative terminal of Circuit 1 is connected to the battery.

Part 3

32 **Fireflies release light from specialized cells in a part of their body called the lantern. The light produced releases very little heat. The firefly signals attract other fireflies and also warn predators that they taste bad. Some female fireflies produce "false signals" to attract male fireflies. These "false signals" are a response to a male light signal. The attracted male firefly comes to the light of the female firefly. The female firefly then eats the male firefly.**



Firefly

Explain why fireflies have different types of specialized cells. In your explanation, be sure to include

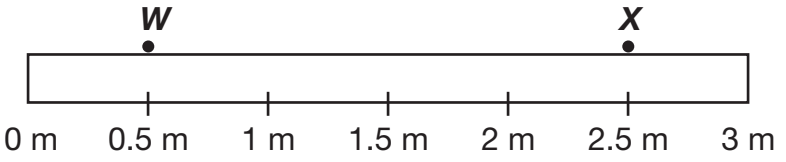
- **how these specialized cells help the fireflies survive**

Part 3

Write your answer in the space provided.

Part 3

33 **A student pushed a toy car from Point *W* to Point *X* in 3 seconds.**



Which statement best describes the distance the car traveled?

- ○ **A** The car traveled 2 meters.
- ○ **B** The car traveled 2.5 meters.
- ○ **C** The car traveled for 3 seconds.
- ○ **D** The car traveled 3 meters per second.

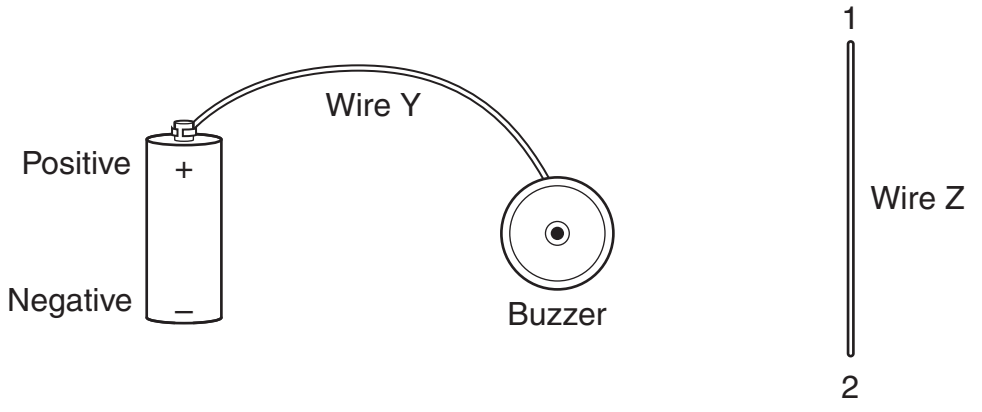
34 **A scientist investigated how well plants native to Maryland would grow in desert conditions. The scientist placed equal amounts of desert soil into 10 identical containers. Each container held two of the same kind of plant. The scientist investigated a total of 10 different kinds of plants. The scientist placed all of the containers into a greenhouse adjusted to produce hot, desert-like conditions. The scientist gave the plants equal, but small amounts of water for the next five weeks. Most of the plants did not survive after the five week investigation.**

Which statement best explains why 16 of the plants did not survive?

- ○ **A** Plants do not grow in desert conditions.
- ○ **B** Few plants survive severe changes to their environment.
- ○ **C** Plants native to Maryland are not good for scientific studies.
- ○ **D** Plants native to Maryland are only able to survive in Maryland.

Part 3

35 **The diagram below shows an incomplete circuit.**



Which action, using Wire Z, completes the circuit so the buzzer will sound?

- ○ **A** Connect 1 to the positive end of battery; connect 2 to the bottom of the buzzer.
- ○ **B** Connect 1 to the negative end of battery; connect 2 to the bottom of the buzzer.
- ○ **C** Connect 1 to the positive end of battery; connect 2 to the negative end of battery.
- ○ **D** Connect 1 to the top of the buzzer; connect 2 to the bottom of the buzzer.

Part 4

Part 4

Directions

Use the information below to answer Numbers 36 through 38.

A teacher gave students four rock samples. The students listed their observations about each rock sample in the data table below.

OBSERVATIONS OF ROCK SAMPLES

	Rock 1	Rock 2	Rock 3	Rock 4
Hardness	Not easily scratched	Not easily scratched	Easily scratched	Easily scratched
Edges	Sharp, rough edges	Smooth, round edges	Sharp, rough edges	Smooth, round edges
Color	Solid black color	Different colored particles	Clear and white particles	Solid gray color
Fossil Evidence	No fossils	No fossils	Leaf fossils	Shell fossils

Part 4

36 **Which feature of Rock 3 is evidence that the rock formed near a forest?**

- ○ **A** leaf fossils
- ○ **B** easily scratched
- ○ **C** sharp, rough edges
- ○ **D** clear and white particles

37 **Which of these statements best explains why the edges of Rock 4 are smooth?**

- ○ **A** Fire burned the rock.
- ○ **B** Mud covered the rock.
- ○ **C** The rock tumbled in a river.
- ○ **D** The rock melted in a volcano.

38 **Which of these rock features best indicates that Rock 2 is made of different minerals?**

- ○ **A** does not contain fossils
- ○ **B** does not scratch easily
- ○ **C** has smooth, round edges
- ○ **D** contains different colored particles

Part 4

Directions

Use the information below to answer Numbers 39 and 40.

A Green Community

Many cities in the United States are developing "green communities." A green community is intended to reduce the use of energy and consists of houses, apartments, and nearby businesses. Grocery stores, restaurants, and movie theaters are all within walking distance of the homes in the community. People travel shorter distances to their schools and jobs.

Many of the buildings in a green community are made of renewable and recycled materials. Solar energy keeps the buildings at a comfortable temperature. Natural landscape features, such as trees and plants, are carefully located to provide shade and to control temperatures. Community gardens allow residents to grow food and flowers.

Part 4

39 **People in green communities are using a nonrenewable resource when they**

- ○ **A** heat their homes with wood
- ○ **B** wash vegetables before cooking
- ○ **C** drive gasoline-powered automobiles
- ○ **D** grow flowers in the community garden

40 **Most people in green communities reduce their use of fossil fuel products.**

What group is <u>most</u> negatively affected by green communities?

- ○ **A** oil production workers
- ○ **B** local restaurant owners
- ○ **C** people who ride public transportation
- ○ **D** people concerned about the environment

Part 4

Directions

Use the passage below to answer Numbers 41 through 43.

Making a Splash on Mars

Scientists have known for years that water exists on Mars. There are small amounts of water vapor in the atmosphere, and at the Martian North and South poles there are frozen water ice caps. The north polar cap is mostly water ice (and there is also some frozen carbon dioxide, like dry ice) that is about 1 mile[1] thick! Scientists believe even more water lies deep under the Martian surface.

In June 2000 scientists held a press conference to announce some new pictures of Mars. These pictures showed gullies[2] that looked like flash flood channels[3] on Earth. Scientists already knew that water had once flowed on the red planet, but that was billions of years ago. (We know this because NASA satellites have taken pictures of ancient dried-up riverbeds.) But these channels look like they were made recently, and this surprised the scientists.

One reason they were surprised is that Mars is very cold. It is so cold that the ground should be frozen. Any water in this area should be solid ice.

A second reason that liquid water is surprising is that Mars is so dry. There is so little water vapor in the atmosphere that any pool of water would quickly evaporate. Even on Earth, ocean water evaporates into the sky as part of the water cycle. On Mars, water evaporates more quickly than it would anywhere on Earth.

So: how could there be liquid water on such a planet? Well, this is a very interesting point. On Earth, we talk about the boiling point of water, where it turns into steam or vapor. We also talk about the freezing point of water, where liquid water turns to a solid called ice. Well, it turns out that there is a "triple point" of water. When the temperature and air pressure are just right, water can exist in all three states at once: solid, liquid, and gas—all at the same time!

Oddly, the atmospheric pressure[4] on Mars is very close to the triple point pressure for water (6.1 millibars). All over the red planet, water can change from liquid to solid to gas with just a slight change in pressure.

[1]**1 mile** – 1.6 kilometers
[2]**gullies** – ditches
[3]**channels** – long, narrow waterways
[4]**atmospheric pressure** – air pressure; about 1013.0 millibars on Earth

Part 4

41 **Why were scientists surprised to observe recently formed liquid water channels on Mars?**

- ○ **A** Liquid water is only found below the surface of Mars.
- ○ **B** The surface of Mars is hard rock that cannot be eroded.
- ○ **C** Mars is so hot that all water is in the form of water vapor.
- ○ **D** Mars is too cold for liquid water to flow on the planet surface.

42 **On Mars, 100 grams of ice changes into a liquid.**

When compared to the mass of the solid ice, the mass of the liquid water is

- ○ **A** greater than the mass of the ice
- ○ **B** one half the mass of the ice
- ○ **C** equal to the mass of the ice
- ○ **D** twice the mass of the ice

43 **A physical property of ice is**

- ○ **A** hardness
- ○ **B** flexibility
- ○ **C** attraction by magnets
- ○ **D** good conduction of electricity

Part 4

44 **A group of students investigated several materials often used as conductors or insulators. The investigation results are shown in the data table below.**

Conductors	Insulators
Iron nail	Rubber stopper
Copper wire	Wood block
Aluminum foil	Plastic cup
?	Piece of fur

Which material best completes the data table?

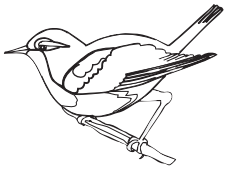
- ○ **A** cloth fabric
- ○ **B** paper towel
- ○ **C** plastic foam
- ○ **D** silver spoon

Part 4

45 **Some organisms require little water to live.**

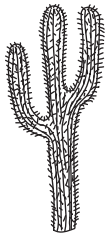
Which organism is <u>least likely</u> affected by a drought?

○ **A**



Bird

○ **B**

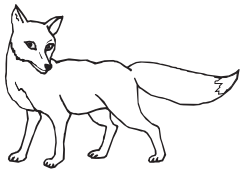


Cactus

○ **C**

Grass

○ **D**



Fox

46 **Students measure the time for toy cars of different masses to roll down a hill.**

Which of the following units should the students use to measure time?

○ **A** centimeters

○ **B** grams

○ **C** milliliters

○ **D** seconds

Acknowledgements

“Making a Splash on Mars” from http://www.thursdaysclassroom.com, a service of NASA.