Maryland School Assessment

Science

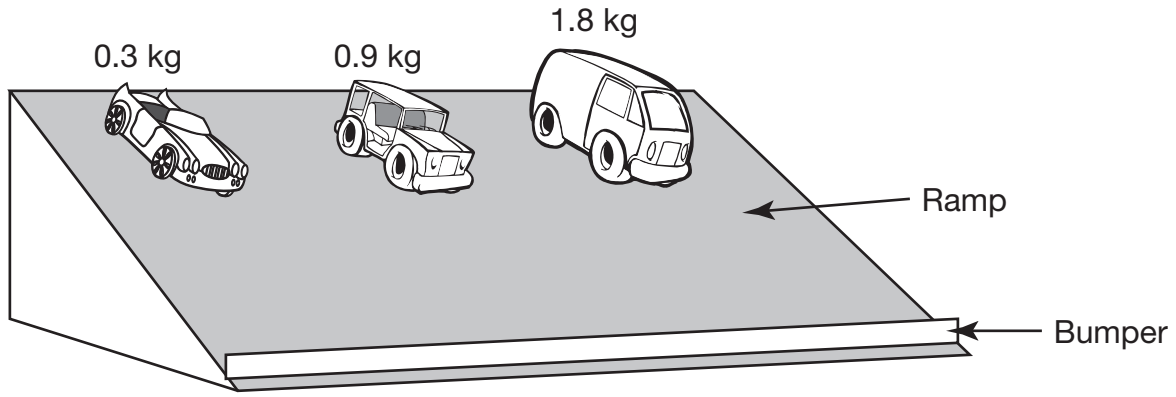
2013 Public Release

Grade 8

Part 1

Part 1

1 **Gravity pulled three toy cars of different masses down an inclined ramp. The toy cars hit a bumper at the bottom of the ramp.**



What is the ratio of the masses of the toy cars?

○ **A** 1:2:3

○ **B** 1:3:6

○ **C** 1:6:12

○ **D** 1:9:18

Part 1

2 **Each layer of Earth has different properties.**

Which statement best describes the mantle of Earth?

- ○ **A** The mantle lies below the core.
- ○ **B** The mantle is composed of hot gases.
- ○ **C** The mantle lies between the core and the crust.
- ○ **D** The mantle temperature is lower than the crust temperature.

3 **Geologists have identified seven major tectonic plates at the surface of Earth.**

Which evidence best indicates that tectonic plates collide?

- ○ **A** Wind erodes surface rock formations.
- ○ **B** Fossils date back thousands of years.
- ○ **C** Small rocks are left behind when glaciers retreat.
- ○ **D** Older layers of rock are located above newer layers of rock.

Part 1

Directions

Use the information below to answer Numbers 4 and 5.

Sheep Challenge Evolution

A species of sheep lives on the Scottish island of Hirta. Hirta has plenty of grass for the sheep to eat, and no natural predators of the sheep live on the island. Some sheep have dark wool, and some have light wool. The sheep with dark wool tend to be much larger and stronger than the sheep with light wool. However, researchers have found that in the last 20 years, the sheep with light wool have increased in number. Usually, strength and size help animals survive and breed.

Part 1

4 **A new sheep predator is introduced to the island.**

Which change to the sheep population will <u>most likely</u> occur first?

- ○ **A** a decrease in the population of sheep with dark wool
- ○ **B** a decrease in the population of sheep with light wool
- ○ **C** an increase in the population of sheep with dark wool
- ○ **D** an increase in the population of sheep with light wool

5 **On Hirta, sheep with light wool outnumber sheep with dark wool because sheep with light wool**

- ○ **A** produce more wool
- ○ **B** have a more restricted diet
- ○ **C** produce fewer offspring each year
- ○ **D** have a better chance of surviving and reproducing

Part 1

6 **Life on Earth depends on water existing in different states of matter.**

Explain how the state of matter of water changes as it circulates through the water cycle. In your explanation, be sure to include

- **a description of the water cycle**
- **atmospheric conditions that affect the state of matter of water in the water cycle**

Write your answer in the space provided.

Part 1

7 **The elements sulfur (S) and oxygen (O_2) combine to form a substance called sulfur dioxide (SO_2). Sulfur dioxide is also formed when coal and oil are burned.**

Sulfur dioxide can best be described as

- ○ **A** a metal
- ○ **B** an atom
- ○ **C** a compound
- ○ **D** a nonreactive gas

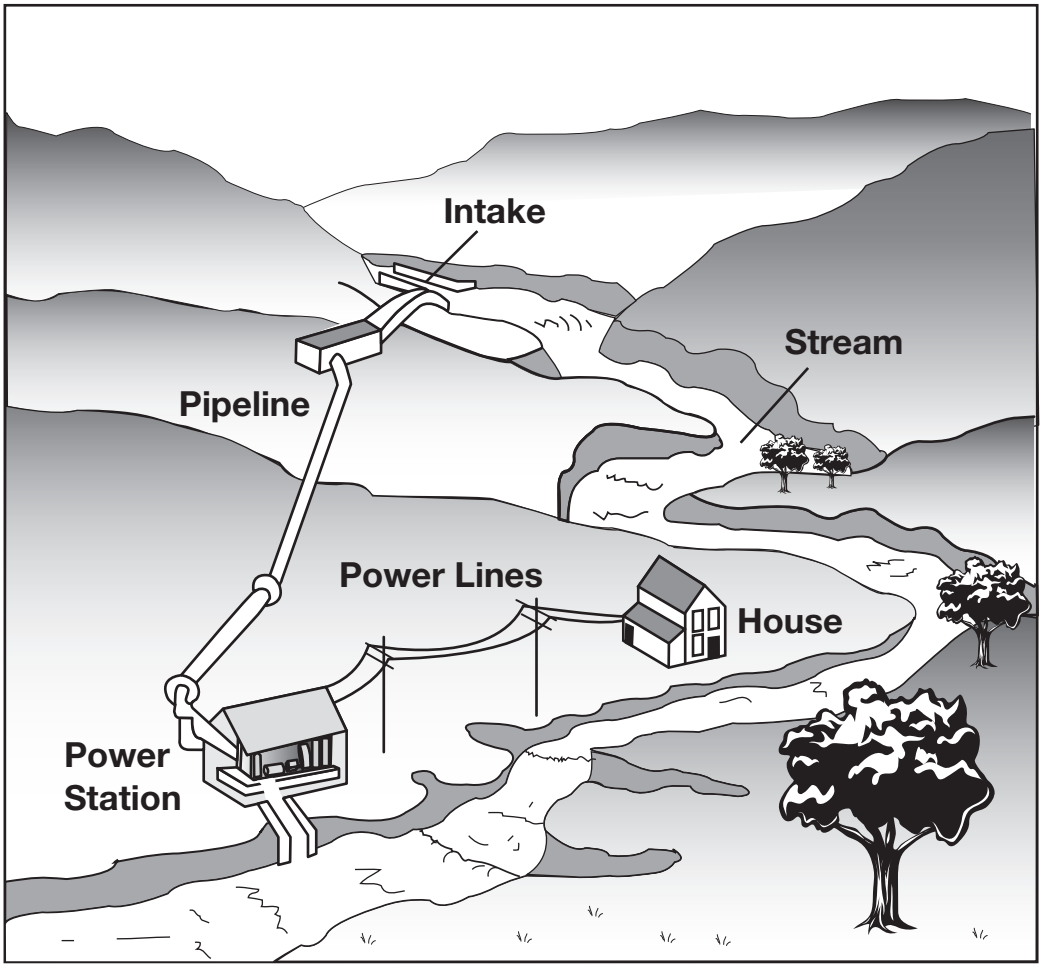
Part 1

Directions

Use the information below to answer Numbers 8 through 10.

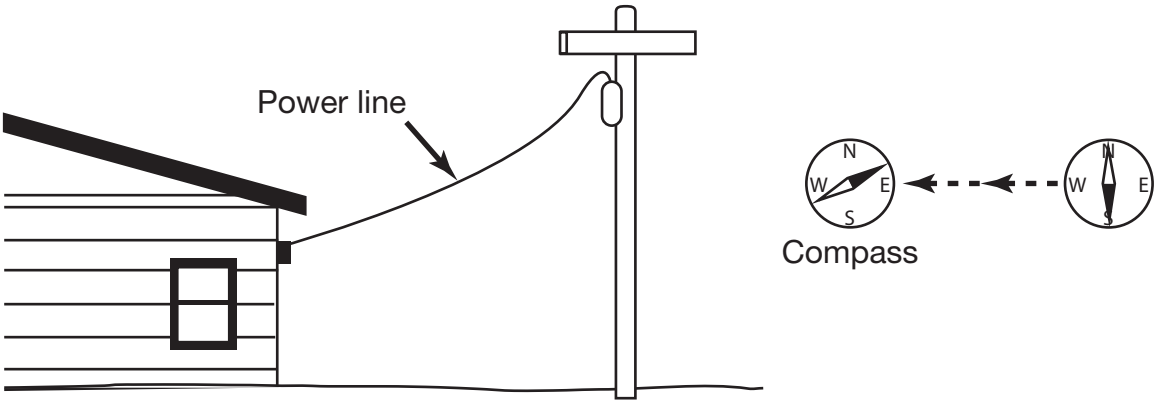
Micro-hydropower

Micro-hydropower systems generate small amounts of electricity from moving water. These small systems are able to supply electricity to farms, ranches, and homes. Some of the moving water from a stream or river is redirected by an intake through a pipeline to a small turbine in a power station. The turbine turns coils of wires in a magnetic field to produce electricity. A simple diagram of a micro-hydropower system is shown below.



Part 1

8 **A student moved a compass near the wires of the power lines next to a house. The compass needle then changed direction.**



The compass needle moved because

- ○ **A** an electric field surrounded the wires
- ○ **B** a magnetic field surrounded the house
- ○ **C** an electrical current produced in the wires stopped
- ○ **D** a magnetic field was produced by the electric current

Part 1

9 **Which action would increase the amount of electricity produced by a generator?**

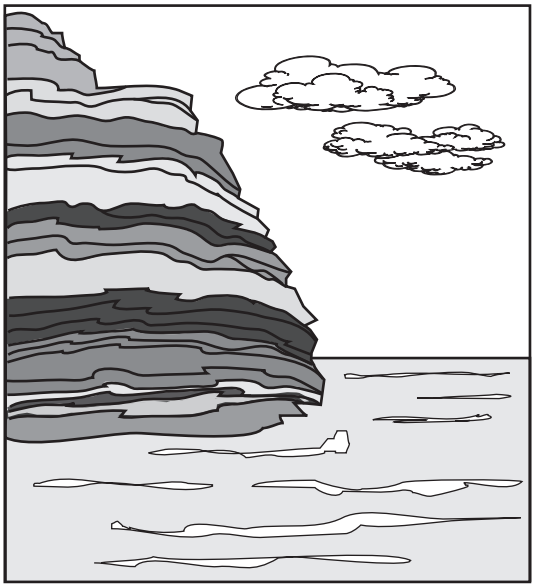
- ○ **A** adding more coils of wire
- ○ **B** removing the iron magnet
- ○ **C** using water that moves slowly
- ○ **D** using additional poles for power lines

10 **Which sequence represents the transformation of energy from moving water to a generator and then to a battery?**

- ○ **A** electrical to chemical to light
- ○ **B** electrical to chemical to sound
- ○ **C** mechanical to chemical to electrical
- ○ **D** mechanical to electrical to chemical

Part 1

11 **A cliff made of rock is shown in the diagram below.**



Which feature of this cliff provides the best evidence that it is made of sedimentary rock?

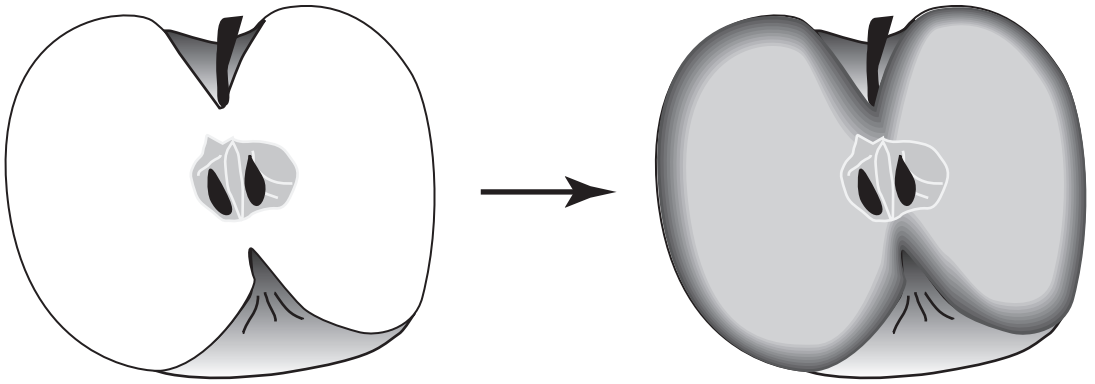
- ○ **A** height
- ○ **B** layers
- ○ **C** location
- ○ **D** shape

STOP

Part 2

Part 2

12 **A student cut an apple into pieces and exposed the pieces to air. The light-colored surface of the apple turned darker after several minutes as shown in the diagrams below.**



Apple Immediately After Cutting

Apple Several Minutes After Cutting

This change can be classified as a chemical change because

- ○ **A** the change occurred in Earth's atmosphere
- ○ **B** the change occurred each time the apple was cut
- ○ **C** the physical properties of the apple remained the same
- ○ **D** the physical properties of the apple permanently changed

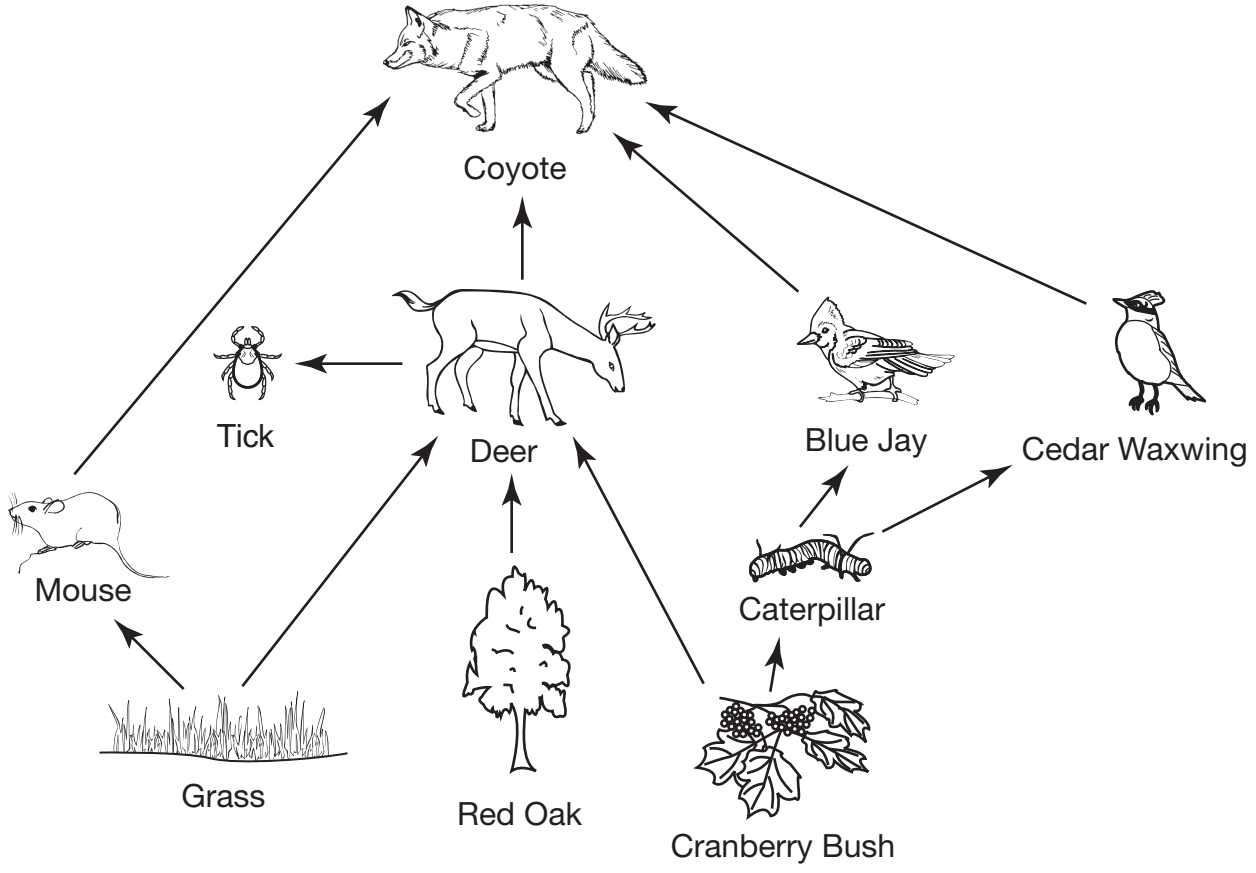
Part 2

Directions

Use the information and the diagram below to answer Numbers 13 and 14.

Partial Forest Food Web

The movement of energy and matter through some organisms in a forest ecosystem is shown in this food web.



Part 2

13 **Which food chain best shows the flow of matter in organisms in the food web?**

- ○ **A** tick → mouse → red oak
- ○ **B** grass → deer → blue jay
- ○ **C** cranberry bush → deer → coyote
- ○ **D** blue jay → caterpillar → cedar waxwing

14 **Which two organisms in the food web share the most similarities in external structures?**

- ○ **A** the mouse and the deer
- ○ **B** the tick and the caterpillar
- ○ **C** the grass and the red oak
- ○ **D** the blue jay and the cedar waxwing

Part 2

15 **A science teacher asked two students to each write a hypothesis about how the mass of an object affects the speed of that object.**

Student 1:

> **As the mass of an object increases, the speed of the object also increases.**

Student 2:

> **As the mass of an object decreases, the speed of the object increases.**

Explain the value of a hypothesis. In your explanation, be sure to include

- **the purpose of a hypothesis**
- **a likely procedure to test these two hypotheses**

Part 2

Write your answer in the space provided.

Part 2

Directions

Use the technical passage below to answer Numbers 16 through 18.

A Natural Snake-Bite Antidote?

Snake bites and bee stings can be either painful or downright deadly, depending on which species is doing the biting, and sometimes whether the person being bitten is allergic to the venom.

New research in mice suggests that these bites and stings would be even more dangerous if not for a special defensive trick that the mouse's immune system can pull off.

Dr. Stephen Galli of Stanford University and his colleagues studied mast cells, which are immune cells that contribute to the inflammation that's part of asthma, allergies and even the extreme, anaphylactic shock[1] that can happen to some people with severe allergies to things like peanuts.

In these cases, the immune system gets mixed up and thinks it's being attacked by something harmful. But, mast cells also do beneficial things in the body.

The scientists discovered that the cells also play a helpful role against certain snake and honeybee venoms. In their study they showed that the cells protected mice, making the venom's effects less harmful.

The cells released an enzyme[2] that broke down dangerous components of the venom of a snake called the Israeli mole viper. Dr. Galli said that it might someday be possible to make better snake bite or bee sting treatments that are based on this type of enzyme. More research will be necessary to see if this is possible.

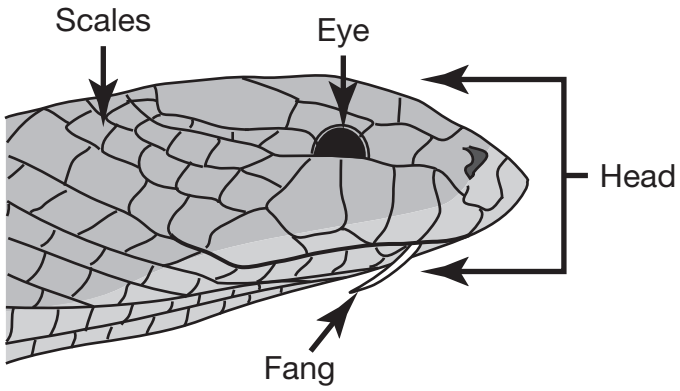
Dr. Galli thinks that this feature of the mast-cell defense system may have evolved, in animals that are prey to snakes or get stung by bees, partly as a way to help to protect against venom. This defense isn't foolproof or perfect, but it gives the prey animals a better chance of survival, especially if they get less than a "full dose" of venom in the bite of a poisonous snake.

[1]**anaphylactic shock** – a severe allergic reaction that occurs rapidly and causes a life-threatening response involving the whole body

[2]**enzyme** – a protein in the body that helps control a chemical reaction

Part 2

16 **The Israeli mole viper has a small head, shiny black scales, small eyes, and hollow fangs.**



Which feature enables the snake to inject venom into prey animals?

- ○ **A** small head
- ○ **B** black scales
- ○ **C** small eyes
- ○ **D** hollow fangs

Part 2

17 **The mast cells of the human body are responsible for**

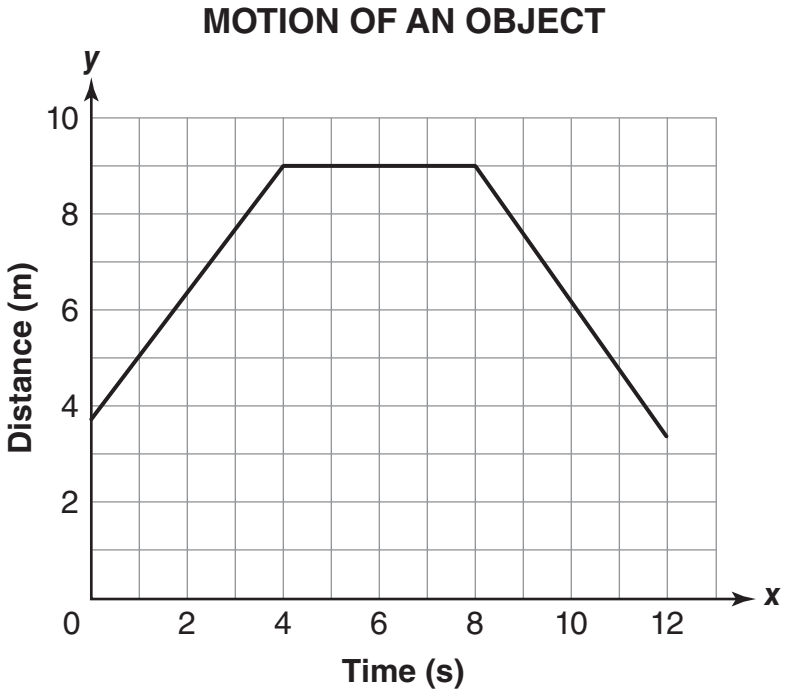
- ○ **A** defense
- ○ **B** reproduction
- ○ **C** removing waste
- ○ **D** providing energy

18 **Which body system most likely distributes the venom of a snake within the body of a prey animal that has been bitten?**

- ○ **A** circulatory
- ○ **B** digestive
- ○ **C** excretory
- ○ **D** immune

Part 2

19 **The graph below represents the distance an object traveled in 12 seconds.**



Which statement describes the motion of the object between 4 seconds and 8 seconds?

○ **A** The object is not moving.

○ **B** The object is moving sideways.

○ **C** The speed of the object is increasing.

○ **D** The speed of the object is decreasing.

Part 2

20 **Energy changes form or is transferred through the action of forces.**

An example of kinetic energy changing to potential energy is

- ○ **A** a boulder sitting on a cliff
- ○ **B** a person running around a track
- ○ **C** a car being driven up a hill and being parked
- ○ **D** a rubber band being stretched and being broken

Part 2

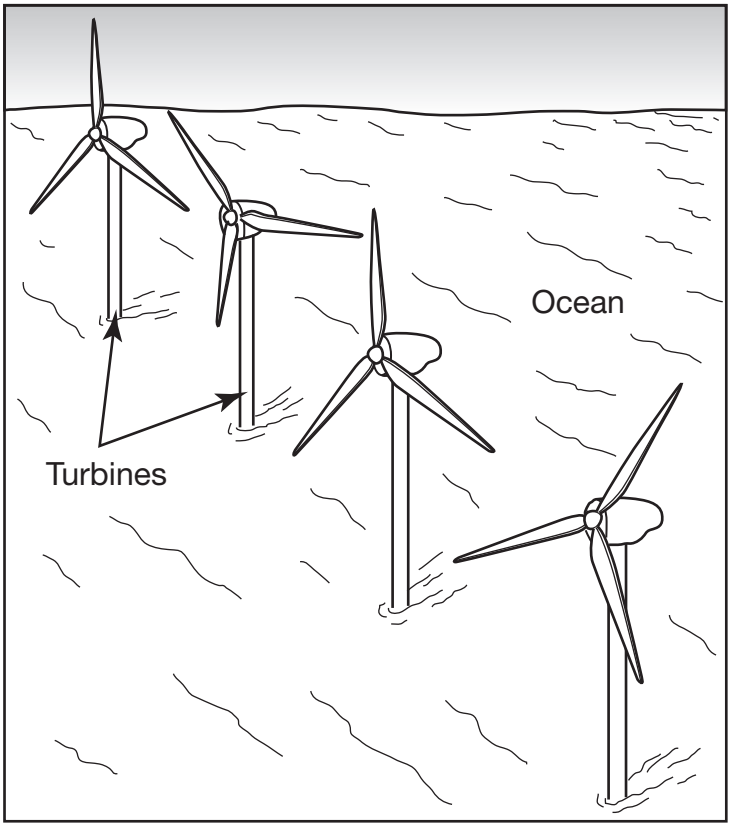
Directions

Use the information below to answer Numbers 21 and 22.

Wind Energy or Coal Energy

Most of Maryland's electricity comes from coal-fired power plants. Coal-fired power plants are inexpensive to operate but release harmful gases and solid particles into the air. These harmful gases contain chemicals that combine with water vapor, turning ordinary rain into acid rain.

Wind turbines transform wind into electrical energy and do not produce harmful gases. Wind turbines can be constructed offshore in the ocean. Some people object to the turbines because the turbines are expensive and the motion of the blades may affect wildlife.



Part 2

21 **Using wind turbines instead of burning coal affects the natural processes in Maryland by**

- ○ **A** slowing down the water cycle
- ○ **B** distributing liquid water more evenly
- ○ **C** increasing the amount of liquid water available
- ○ **D** keeping harmful chemicals out of the water cycle

22 **Which group would be most negatively affected by the appearance of the wind turbines off the coast of Maryland?**

- ○ **A** people who like to visit Maryland
- ○ **B** people who construct wind turbines
- ○ **C** Maryland residents who live near wind turbines
- ○ **D** Maryland residents who want to prevent acid rain

Part 3

Part 3

23 **A science teacher mixes two different substances in a plastic bag and seals the bag. The bag expands and breaks open.**

What is the most likely reason the bag expanded after the two substances were mixed?

○ **A** The substances became cooler and expanded.

○ **B** The substances physically changed the plastic.

○ **C** The substances became warm and stretched the bag.

○ **D** The substances chemically reacted and produced a gas.

Part 3

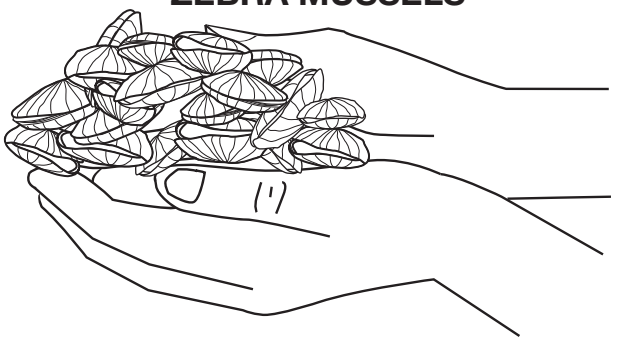
Directions

Use the information below to answer Numbers 24 through 26.

Zebra Mussels

Zebra mussels have been found in the Chesapeake Bay. These small, non-native mussels sometimes cause economic, environmental, and ecological problems. They block the water intake pipes of industrial plants and limit the ability of the plants to generate power, provide drinking water, or treat sewage. The mussel populations grow rapidly and spread to other bodies of water by attaching to boats and equipment below the surface of the water. They consume large amounts of the algae in the water and may decrease the oxygen level of the water. Many beaches are also littered with the sharp shells of decaying zebra mussels.

ZEBRA MUSSELS



Part 3

24 **Which outcome of the increase in the population of zebra mussels would most affect fishermen in Maryland?**

- ○ **A** sharp shells from zebra mussels littering the beaches
- ○ **B** zebra mussels blocking power plant intake tubes
- ○ **C** increased odor from decaying zebra mussels
- ○ **D** decreased oxygen levels in the waterways

25 **Zebra mussels most likely compete with other organisms for**

- ○ **A** air
- ○ **B** habitat
- ○ **C** sunlight
- ○ **D** carbon dioxide

26 **An increase in a population of zebra mussels would best be supported by a body of water which has**

- ○ **A** many beaches
- ○ **B** few intake pipes
- ○ **C** many algae plants
- ○ **D** few boating activities

Part 3

Directions

Use the technical passage below to answer Numbers 27 through 29.

Waste Not: Energy from Garbage and Sewage

A hundred years ago, gas was collected from rotting sewage and used to light streetlamps. New technologies hope to update this concept—tapping garbage as well as human waste—for an energy-hungry world.

One promising device is called a microbial[1] fuel cell. It makes electricity much like a hydrogen fuel cell,[2] but it runs off wastewater. Sewage-eating bacteria drive a chemical process that generates current and, as a bonus, helps purify the water.

Bruce Logan of Pennsylvania State University and his colleagues have constructed small microbial fuel cells, no bigger than a can that can power various devices, including a small fan.

"If you had 100,000 people and you treat their sewage, you could get up to 2.3 megawatts of continuous power, which is enough to supply electricity for 1,500 homes," Logan said. A megawatt is one million watts.

A self-sufficient water-treatment device is also something that NASA is interested in. Bruce Rittman of Northwestern University is currently devising a microbial fuel cell that could be used on manned space missions.

"You have to recycle everything up in space," Rittman said. "You want to capture food waste and human waste, as well as recycle water."

A microbial fuel cell has some advantages over the more traditional method, called an anaerobic digester,[3] which collects the methane, or "biogas," that bacteria belch out when they consume organic material in the absence of oxygen. The methane is later burned to turn a turbine generator.

"Instead of going through the intermediate step of combustion,[4] a cell makes the electricity directly," Rittman said.

Part 3

This direct route means that a microbial fuel cell could potentially extract more energy from a given amount of sewage. It also would avoid the pollution that burning methane produces.

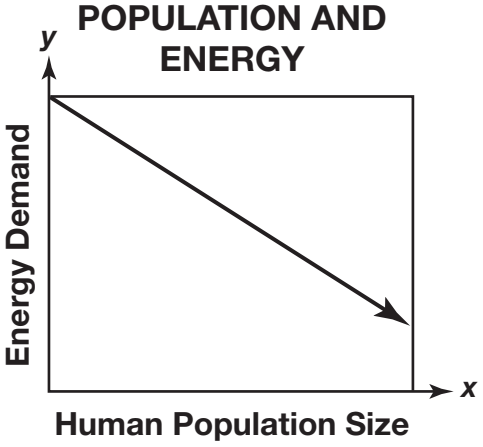
But both Rittman and Logan are quick to add that cells are still early in development, whereas digesters are in use, mostly in agriculture settings where the concentration of organic material is higher than from urban sewers.

[1]**microbial** – pertaining to very small organisms, such as bacteria
[2]**hydrogen fuel cell** – a device that uses hydrogen to produce electricity
[3]**anaerobic digester** – a container where plant or animal material decomposes without oxygen
[4]**combustion** – burning

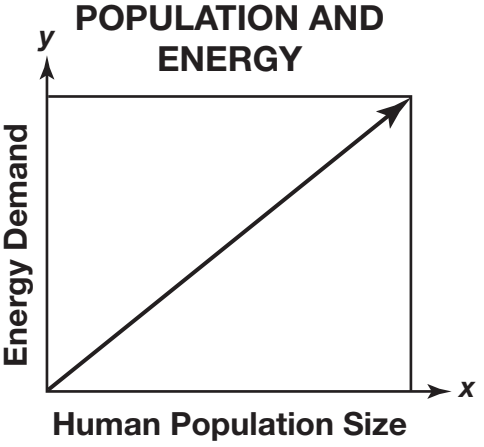
Part 3

27 **Which graph <u>best</u> displays the relationship between human population size and energy demand?**

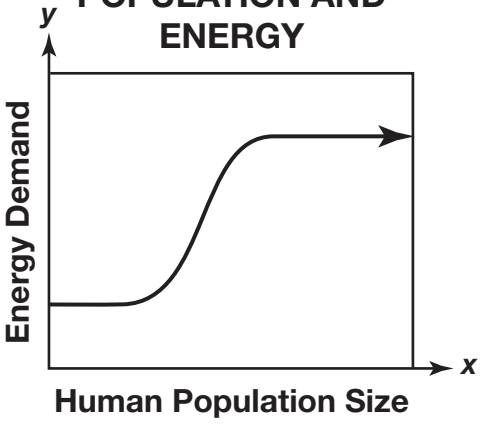
○ **A**



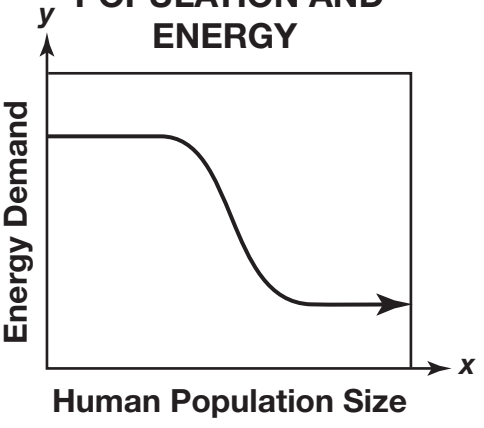
○ **B**



○ **C**



○ **D**



Part 3

28 **What type of energy do microbial fuel cells convert into electrical energy?**

- ○ **A** kinetic energy
- ○ **B** nuclear energy
- ○ **C** chemical energy
- ○ **D** mechanical energy

29 **Using microbial fuel cells for energy would likely reduce the need to**

- ○ **A** mine coal
- ○ **B** mine copper
- ○ **C** recycle soil
- ○ **D** recycle sewage

Part 3

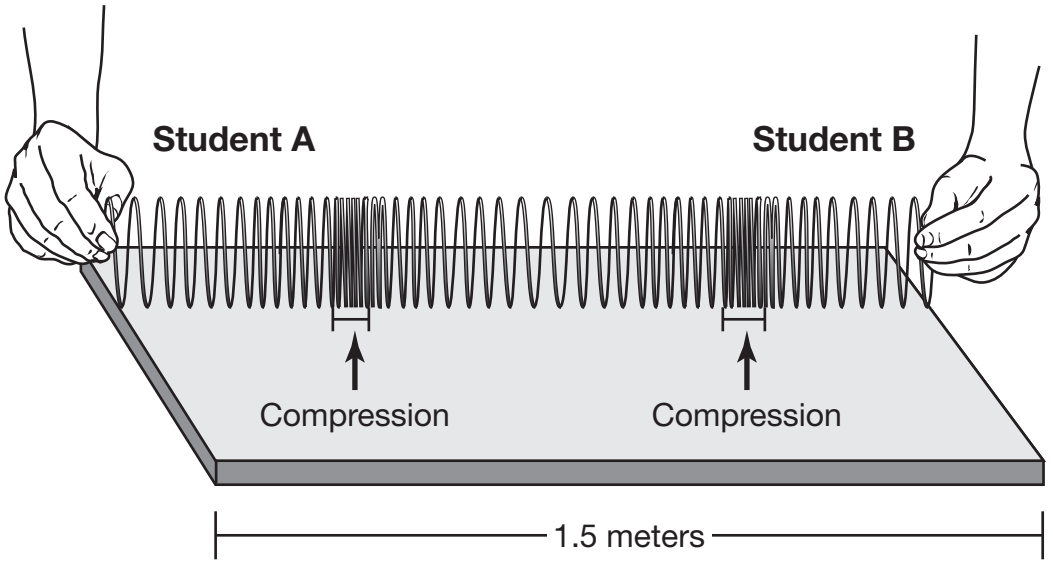
Directions

Use the information and the diagram below to answer Numbers 30 and 31.

Wave Motion in a Plastic Spring

Two students investigated wave motion in a plastic spring. Each student held an end of the spring on a table 1.5 meters long. Student A compressed and released a portion of the spring. This action produced a wave that traveled through the spring across the table. Using a stopwatch, the students determined that the wave traveled through the spring in 0.5 seconds.

WAVE MOTION IN A PLASTIC SPRING



Part 3

30 **The wave motion produced by the spring transfers**

- ○ **A** energy
- ○ **B** friction
- ○ **C** mass
- ○ **D** particles

Part 3

31 **Different types of waves have different properties.**

Compare the types of wave motion produced by springs, sound, light, and earthquakes.

Write your answer in the space provided.

Part 3

32 **A container is filled with a mixture of sand and an unknown substance.**

What should a student do to determine whether iron particles are in the mixture?

- ○ **A** heat the mixture
- ○ **B** filter the mixture
- ○ **C** pour water into the mixture
- ○ **D** pull a magnet through the mixture

33 **Hydrogen and oxygen combine to form water.**

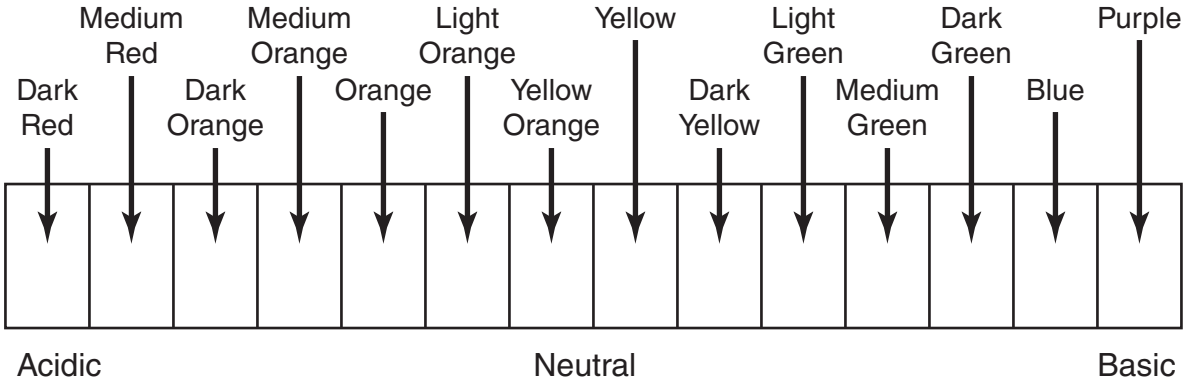
The water in this reaction is described as

- ○ **A** an atom
- ○ **B** a reactant
- ○ **C** an element
- ○ **D** a compound

Part 4

34 **Scientists use pH paper to classify substances as being acidic, basic, or neutral. This pH paper changes color to reflect whether a substance is acidic, basic, or neutral.**

pH PAPER COLORS



Which color on the pH paper would indicate the strongest acid?

- ○ **A** light orange
- ○ **B** dark yellow
- ○ **C** dark red
- ○ **D** purple

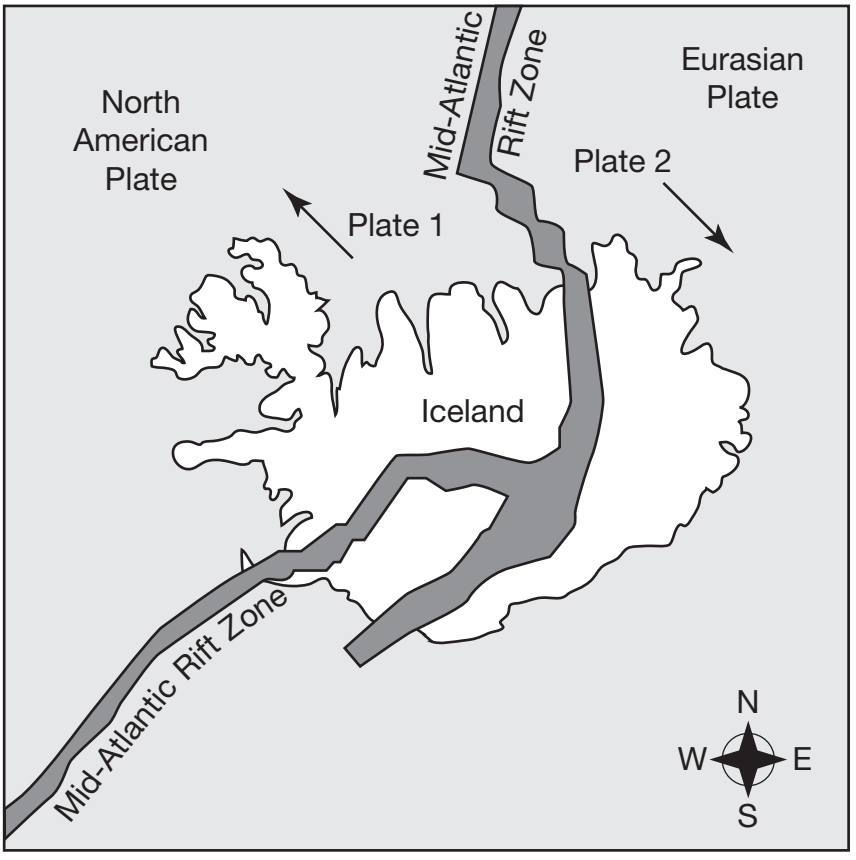
Part 4

Directions

Use the information and map below to answer Numbers 35 and 36.

The tectonic plates on opposite sides of a rift zone are continuously moving outward, away from a break in the crust of Earth. The Mid-Atlantic Rift Zone is located in the Atlantic Ocean. This rift zone stretches from the Arctic Ocean in the Northern Hemisphere to beyond the southern tip of Africa in the Southern Hemisphere. Within the central rift zone, new crust forms.

Iceland is an island sitting atop the northern part of the Mid-Atlantic Rift Zone. Over time, activity along the rift zone has changed the geologic features of Iceland.



Part 4

35 **How will movement of the tectonic plates most likely continue to change the geologic features of Iceland?**

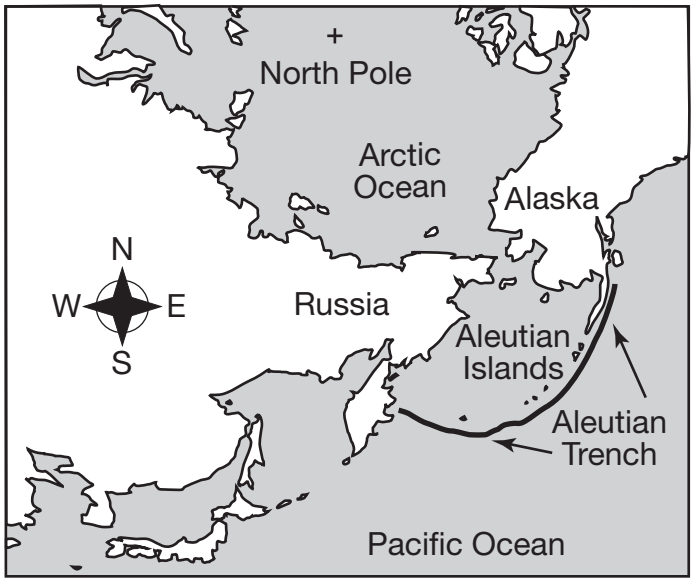
- ○ **A** The surrounding ocean will cover Iceland.
- ○ **B** The glaciers covering Iceland will increase.
- ○ **C** The surface of Iceland will become smooth and flat.
- ○ **D** The surface of Iceland will increase from east to west.

36 **Which action is most likely responsible for the movement of the tectonic plates?**

- ○ **A** the rotation of Earth on its axis
- ○ **B** the gravitational force of the sun
- ○ **C** magnetic attraction from the core
- ○ **D** convection currents in the mantle

Part 4

37 **The Aleutian Trench in the Pacific Ocean lies between Alaska and Russia. Volcanic eruptions formed a chain of islands, called the Aleutian Islands, north of the trench.**

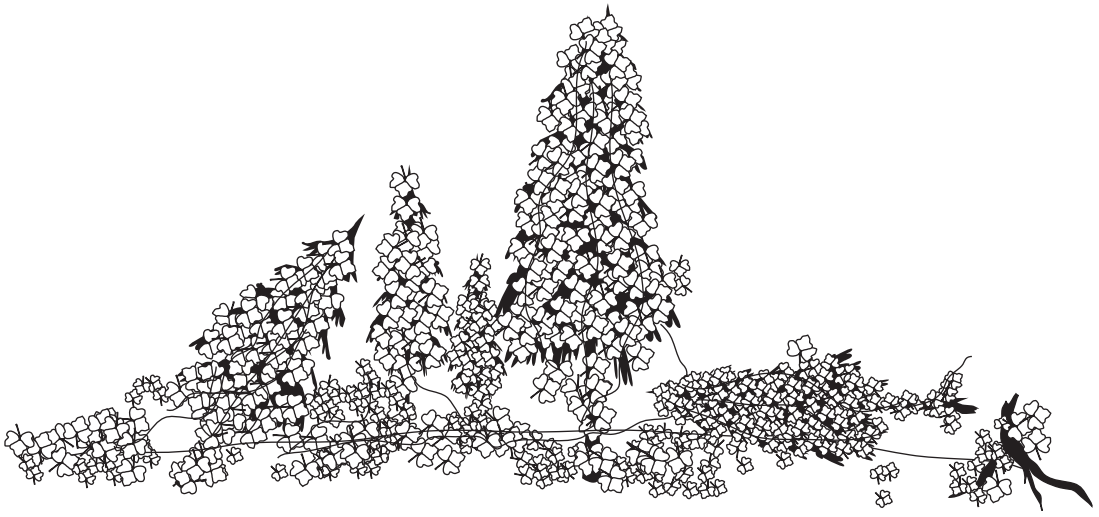


The Aleutian Trench and Islands indicate the location where

- ○ **A** the waters of two oceans meet
- ○ **B** the edges of two tectonic plates meet
- ○ **C** sedimentary rocks touch metamorphic rocks
- ○ **D** a stream of fresh water runs under the ocean

Part 4

38 **Kudzu, a nonnative plant, was introduced as a garden plant into the United States. Kudzu is an invasive, climbing vine with large leaves. Kudzu quickly covers trees, shrubs, buildings, and other objects.**



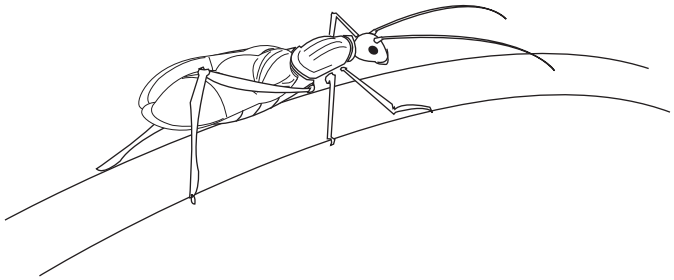
Describe how the introduction of kudzu affects an environment. In your description, be sure to include

- **the effects on other plants**
- **the effects on food webs**

Part 4

Write your answer in the space provided.

39 **Students counted the number of chirps made at different temperatures in 13 seconds by the same group of snowy tree crickets.**



The students recorded the data in the table below. One student concluded that at 22°C there would be 39 chirps.

NUMBER OF CRICKET CHIRPS

Temperature (°C)	Chirps per 13 Seconds
16	20
18	24
20	28
24	35

The student's conclusion is <u>most likely</u> invalid because

○ **A** the investigation contains two variables

○ **B** the data does not support the reasoning

○ **C** the number of crickets studied was too small

○ **D** the species of crickets used is not usually studied

Part 4

40 **A scientist will repeat an investigation many times before finally making a conclusion.**

Which reason best explains why a scientist repeats an investigation?

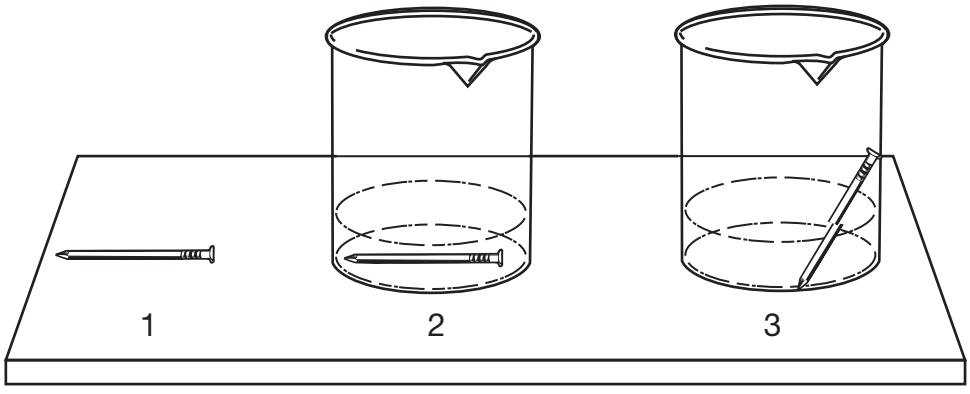
- ○ **A** Repetition is needed to prove a hypothesis.
- ○ **B** Repetition is required to publish a conclusion.
- ○ **C** Repetition ensures the accuracy of obtained data.
- ○ **D** Repetition helps scientists remain objective about observations.

Part 4

Directions

Use the information below to answer Numbers 41 through 43.

A student conducted an investigation to determine which condition caused the greatest amount of rust to form on an iron nail. Iron Nail 1 was placed on a table. Iron Nail 2 was submerged in a beaker of water. Iron Nail 3 was partially submerged in another beaker of water. The setup for the investigation is illustrated below.



The student recorded observations about the nails on Day 1 and Day 8 in the table below.

OBSERVATIONS OF IRON NAILS

Iron Nail	Day 1	Day 8
1	Metallic silver	Metallic silver
2	Metallic silver	Metallic silver with spots of reddish-brown color
3	Metallic silver	Metallic silver with spots of reddish-brown color on the part submerged

Part 4

41 **Which statement best describes the physical properties of the nail after the rust developed?**

- ○ **A** Most of the nail dissolved and the color remained the same.
- ○ **B** The nail remained a solid and the color remained the same.
- ○ **C** Most of the nail dissolved and the color changed.
- ○ **D** The nail remained a solid and the color changed.

42 **The beaker with Iron Nail 2 was placed in a freezer.**

Which result most likely occurred when the heat energy was removed from the water in the beaker?

- ○ **A** The nail floated.
- ○ **B** The nail dissolved.
- ○ **C** The water solidified.
- ○ **D** The water evaporated.

43 **Which statement best explains why rust formed on two of the iron nails?**

- ○ **A** The iron nail physically reacted with the air.
- ○ **B** The iron nail physically reacted with the water.
- ○ **C** The iron nail chemically reacted with carbon in the air.
- ○ **D** The iron nail chemically reacted with oxygen in the water.

Part 4

44 **Students are investigating which type of fruit attracts the most fruit flies. Equally sized pieces of ripe apple, peach, and banana are placed in separate containers. The containers allow fruit flies to enter, but the fruit flies are unable to escape. The containers are placed outside on a picnic table for two days.**

The most reliable method for collecting data is to count the number of fruit flies

- ○ **A** on all three types of fruit every two hours
- ○ **B** on all three types of fruit after each fruit spoils
- ○ **C** on the banana on Day 1, the apple on Day 2, and the peach on Day 3
- ○ **D** on the banana after Hour 1, the apple after Hour 2, and the peach after Hour 3

STOP

Acknowledgements

"A Natural Snake-Bite Antidote" from *EurekaAlert! Science Reporting for Kids* (http://www.eurekalert.org/features/kids/2006-07/aaft-ans072106.php). Reprinted with permission from AAAS

"Waste Not: Energy form Garbage and Sewage" by Michael Schriber from *Live Science*, November 2004, Imaginova Corp.