Maryland School Assessment

Science

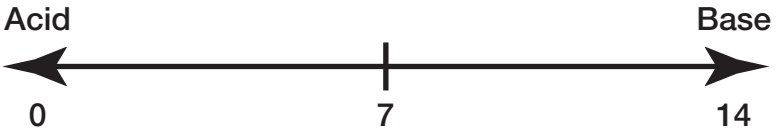
2009 Public Release

Grade 8

Part 1

Part 1

1 **A student classifies a substance as an acid.**



Which of the following substances is the most acidic?

- ○ **A** a substance that has a pH of 8
- ○ **B** a substance that has a pH of 7
- ○ **C** a substance that has a pH of 5
- ○ **D** a substance that has a pH of 2

2 **The period of rotation for each planet in our solar system is different.**

The period of rotation for Earth is

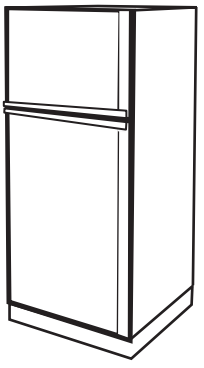
- ○ **A** 24 hours
- ○ **B** 28 days
- ○ **C** 13 weeks
- ○ **D** 1 year

Part 1

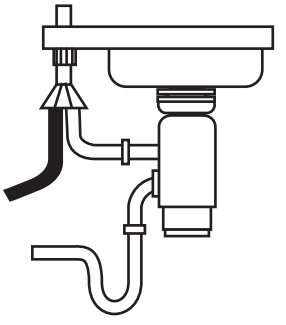
Directions

Use the information below to answer Numbers 3 through 5.

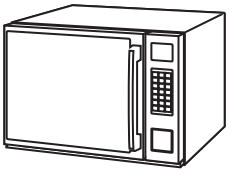
The pictures represent several kitchen appliances. Each of these appliances uses electricity.



Refrigerator



Garbage Disposal



Microwave

Stove

Can Opener

Part 1

3 **Many kitchen appliances use electricity.**

What is the most common energy source used to produce electricity?

- ○ **A** wind
- ○ **B** sunlight
- ○ **C** fossil fuel
- ○ **D** river water

4 **A garbage disposal chops waste food into tiny pieces that move easily through sewage pipes.**

A garbage disposal converts electrical energy to

- ○ **A** heat energy
- ○ **B** radiant energy
- ○ **C** chemical energy
- ○ **D** mechanical energy

5 **Which example best demonstrates conduction?**

- ○ **A** a burner warming a pan
- ○ **B** a refrigerator cooling air
- ○ **C** a stove circulating hot air
- ○ **D** a microwave warming food

Part 1

Directions

Use the technical passage below to answer Numbers 6 through 8.

Drilling to the Mantle

In early 2005, scientists working in the Integrated Ocean Drilling Program (IODP) drilled the third deepest hole ever made in the ocean floor. They were attempting to reach the mantle of Earth. They drilled under water instead of on land because ocean plates are much thinner than continental plates–5 kilometers thick as opposed to 30 kilometers thick.

The IODP drilling occurred at the Atlantis Massif, a large dome-shaped area in the North Atlantic Ocean that is about 16 kilometers wide. In this area, the crust is very thin and the ocean is shallow, making the project easier.

Seismic data were used to choose the location of the thinnest crust. This area is characterized by metamorphic rock deposits. Unfortunately, scientists think the drilling occurred about 305 meters from the correct location. Although rock was recovered from up to 1,416 meters below the sea floor, the mantle was not reached.

There were still useful results, however. One scientist said that the rock collected was from some of the deepest sections of the crust ever reached. These rocks will give geologists a chance to learn more about how the crust was formed.

Rocks brought to the surface from deep in the crust of Earth help geologists better understand the structure of the planet and how it formed. Early ideas about the evolution of Earth are being revised because of these new rock samples.

Scientists know that mantle material is very different from crust material. For example, mantle rock has a different texture and composition than crust material. The amount of minerals in the crust also is different from the amount of minerals in the mantle.

Part 1

6 **The scientists working at the Integrated Ocean Drilling Program are most likely**

- ○ **A** researching the structure of the planet
- ○ **B** looking for more information about ocean food webs
- ○ **C** investigating how fish live in the depths of the ocean
- ○ **D** trying to understand how the ocean influences weather

7 **Which feature best represents the crust of Earth?**

- ○ **A** iron-based rocks
- ○ **B** separate moving plates
- ○ **C** thickest under the ocean floor
- ○ **D** composed mainly of molten rock

Part 1

8 **The Integrated Ocean Drilling Program scientists hypothesized that drilling at the Atlantis Massif would allow scientists to collect rocks from the mantle of Earth.**

Explain why scientists make a hypothesis. In your explanation, be sure to include

- **the importance of a hypothesis**
- **what might be learned from an incorrect hypothesis**
- **supporting evidence from this investigation**

Part 1

Write your answer in the space provided.

GO ON

Part 1

Directions

Use the information below to answer Numbers 9 through 11.

Coal-burning power plants in Maryland release sulfur and nitrogen products into the air that contribute to soot, smog, and acid rain. These have direct effects on the air quality and are thought to increase the temperatures on Earth.

Mercury is also released from coal-burning power plants and is often found in organisms in water. Humans who eat these mercury-contaminated organisms develop brain and nerve tissue more slowly than humans who do not eat mercury-contaminated organisms.

MARYLAND AIR QUALITY AND PUBLIC HEALTH 2002	
Number of days with unhealthy air quality	42
Number of Maryland children with asthma	143,754
Number of Maryland adults with asthma	445,759
Number of asthma attacks due to soot	17,000
Number of lost workdays due to soot	101,977

Part 1

9 **How does air pollution in Maryland most likely affect residents of surrounding states?**

- ○ **A** The residents experience more respiratory illnesses.
- ○ **B** The residents experience fewer eye infections.
- ○ **C** The residents harvest more vegetable crops.
- ○ **D** The residents produce less electricity.

10 **What is the most likely effect on the Maryland environment if increased temperatures melt ice at the North Pole?**

- ○ **A** an increase in sea level
- ○ **B** an increase in waste production
- ○ **C** a decrease in area plant species
- ○ **D** a decrease in local fish populations

11 **Which human action would most likely decrease the release of mercury?**

- ○ **A** limiting the number of boats in waterways
- ○ **B** building more hydroelectric power plants
- ○ **C** limiting the number of vehicles on roads
- ○ **D** building more coal-burning power plants

Part 2

Part 2

12 **Nitrogen, a nutrient found in fertilizer, helps plants increase in size. Rainwater runoff often carries fertilizer into ponds and lakes.**

What effect does excess nitrogen have on organisms in a pond or lake ecosystem?

- ○ **A** Algae grows rapidly.
- ○ **B** Mutations occur gradually in fish.
- ○ **C** Clam shells are slowly weakened.
- ○ **D** Frogs adapt quickly to new food sources.

Part 2

13 **Students measured the length of a flagpole shadow several times during a day. The students recorded their data in the table below.**

LENGTH OF FLAGPOLE SHADOW

Time of Day	Length of Shadow (meters)
10 A.M.	4
11 A.M.	2
Noon	0
1 P.M.	?

What is the length of the flagpole shadow at 1 P.M.?

- ○ **A** 0 meters
- ○ **B** 2 meters
- ○ **C** 4 meters
- ○ **D** 6 meters

Part 2

14 **Electricity has many uses.**

Which device is designed to transform electrical energy into useful heat energy?

- ○ **A** a clock radio
- ○ **B** an electric stove
- ○ **C** an electric motor
- ○ **D** a battery charger

Part 2

15 **Explain how heat energy affects a substance. In your explanation, be sure to include**

- **the temperatures at which a substance changes states of matter**

Write your answer in the space provided.

Part 2

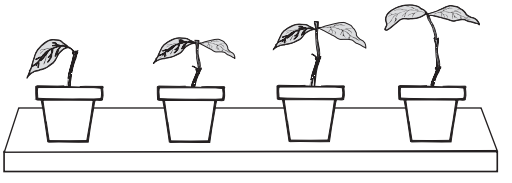
Directions

Use the information below to answer Numbers 16 through 18.

In a lab study, eight bean plants are grown from seeds in individual containers. After a few leaves are visible on each plant, the plants are separated into two groups. One group is placed in a room that gets sunlight, and the other group is placed in a dark room. All of the plants receive the same amount of water daily. After two weeks, the plants are observed.

PLANTS GROWN IN SUNLIGHT

PLANTS GROWN IN DARK ROOM



OBSERVATIONS

Plant Feature	Plants Grown in Sunlight	Plants Grown in Dark Room
Leaves	Dark green	Light yellow
Stem	Green and sturdy	Yellow and wilted
Average Plant Height	30 cm	18 cm

Part 2

16 **Plants use energy from the sun to convert**

- ○ **A** sugars to oxygen and water
- ○ **B** oxygen and water to sugars
- ○ **C** carbon dioxide and water to sugars
- ○ **D** sugars to water and carbon dioxide

17 **All the plants in this investigation were bean plants because**

- ○ **A** the plants were the same color
- ○ **B** plant type was not a tested variable
- ○ **C** each plant received the same amount of sunlight
- ○ **D** a different amount of water was not used for each plant

18 **Some volcanic eruptions release so much ash into the air that the amount of sunlight reaching the surface of Earth is reduced.**

Which requirement for plant growth would be greatly reduced after such an eruption?

- ○ **A** carbon dioxide
- ○ **B** energy
- ○ **C** oxygen
- ○ **D** water

Part 2

19 **Waves produced by different sources are shown in the data table below.**

Source	Type of Wave
Earthquake	Earthquake
Light bulb	Light
Radio	Sound

Which statement best describes the relationship among the waves?

○ **A** All transfer energy.

○ **B** All are the same frequency.

○ **C** All have equal wavelengths.

○ **D** All travel at the same speed.

Part 2

Directions

Use the information below to answer Numbers 20 through 22.

The Hawaiian Islands are home to some of the most studied volcanoes on Earth. The volcanoes erupt often but are seldom explosive because of the magma that they produce. Kilauea volcano is located on the largest of the Hawaiian islands and rises over 4,200 feet above sea level. Kilauea has been erupting continuously since 1983 and has resulted in new landmass.

20 **A fossil found in a surface rock layer is of the same species as a fossil found in a deeper rock layer. However, the two fossils differ slightly in structure.**

Differences in the structures of the fossils indicate that

- ○ **A** this species changed over time
- ○ **B** this species had many predators
- ○ **C** the life span of this species changed
- ○ **D** the food supply of this species changed

Part 2

21 **Why do scientists study rock layers?**

- ○ **A** to find rock fragments
- ○ **B** to find new species of organisms
- ○ **C** to find evidence of the core of Earth
- ○ **D** to find physical evidence of the history of Earth

22 **Which event is best explained by tectonic plate movement?**

- ○ **A** a tornado
- ○ **B** a tsunami
- ○ **C** a hurricane
- ○ **D** a thunderstorm

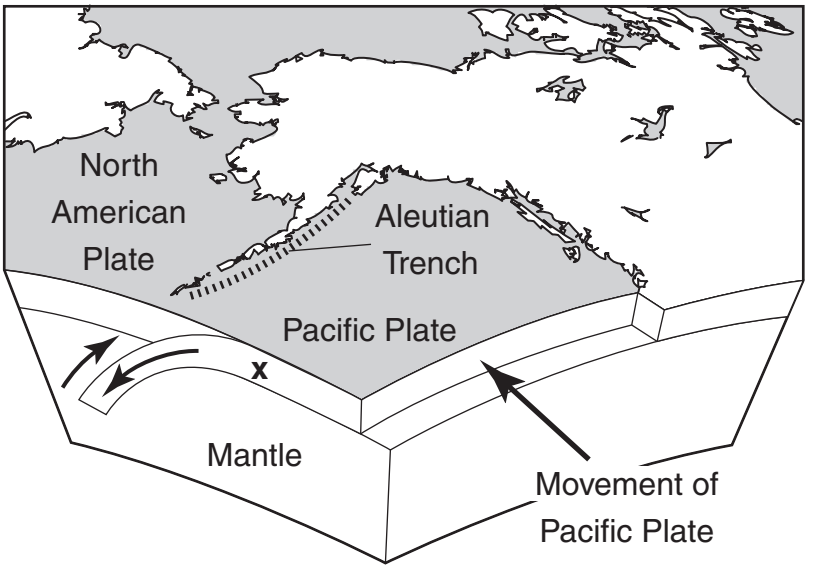
Part 3

Part 3

Directions

Use the information below to answer Numbers 23 and 24.

The Aleutian Trench is an underwater feature, near Alaska, formed by the movement of two tectonic plates. As the North American Plate moves toward the Pacific Plate, the lower edge of the Pacific Plate becomes part of the mantle.



Part 3

23 **Which geologic event often occurs along crustal plate boundaries?**

- ○ **A** glacial erosion
- ○ **B** delta formation
- ○ **C** volcanic activity
- ○ **D** sand dune formation

24 **The core of Earth is <u>best</u> described as**

- ○ **A** a hot mass of metal
- ○ **B** a cold mass of metal
- ○ **C** less dense than the crust
- ○ **D** less dense than the mantle

Part 3

25 **A growing community relies on a nearby lake to provide fresh water for drinking and bathing.**

An increase in the use of fresh water will cause the lake to become

- ○ **A** colder
- ○ **B** deeper
- ○ **C** larger
- ○ **D** smaller

Part 3

Directions

Use the technical passage below to answer Numbers 26 through 28.

Green Ocean Machine

The plants in the window, the trees outside and the broccoli in the refrigerator all have ancient ancestors that didn't used to be green. They only "got green" when they captured smaller green creatures that turn sunlight into food. These small green creatures eventually became the green "chloroplasts" that the plants use to capture energy from the sun through the process of photosynthesis.

In Japan, scientists have now discovered a tiny ocean creature that may be in a similar process of "getting green." This process could eventually provide the tiny sea creatures with their own chloroplasts, or something similar.

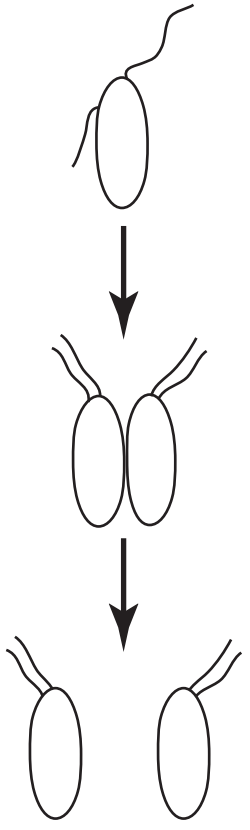
These organisms are called "Hatena" which means "mysterious" in Japanese. Sometimes they are green and sometimes they don't have much of a color at all.

The creatures turn green after they swallow up an even smaller, green sea creature called an "alga." These single-celled creatures stay green until it's time to divide in two. At dividing time, one of the two new cells is green. The other new cell is colorless, though you might say it is "green with envy" because it develops an arm that captures its own green creature. Once Hatena has a green sunlight-capturing alga inside its body, its arm disappears. The new green partner seems to provide Hatena with most of its energy needs.

If the scientists are right, then Hatena and the green critter are in the process of becoming one organism instead of two separate organisms. If this happens, the green creature will become an important sun-capturing part of every Hatena–similar to the green "chloroplasts" found in the plants in the window, the trees outside and the broccoli in the refrigerator.

Part 3

26 **The picture shows a Hatena cell dividing.**



What life function does the picture of the Hatena depict?

- ○ **A** waste removal
- ○ **B** energy extraction
- ○ **C** sexual reproduction
- ○ **D** asexual reproduction

Part 3

27 **The data table below shows four investigational setups that might help a scientist test the following hypothesis: "If an alga provides Hatena with the ability to capture energy, then the Hatena with the alga will survive better."**

Investigational Setup	Beaker X	Beaker Y	Sunlight
1	Hatena and alga	Hatena only	Yes
2	Hatena and alga	Hatena only	No
3	Hatena and alga	Alga only	Yes
4	Hatena and alga	Alga only	No

Which investigational setup would best help the scientist test the hypothesis?

○ **A** 1

○ **B** 2

○ **C** 3

○ **D** 4

Part 3

28 **The passage states that "the new green partner [alga] seems to provide Hatena with most of its energy needs."**

Describe the process that enables organisms to use energy from light to make food. In your description, be sure to include

- **the specialized features needed to produce food**
- **the substances needed to produce food**
- **the substances produced during this process**

Part 3

Write your answer in the space provided.

Part 3

Directions

Use the information below to answer Numbers 29 through 31.

Cotton is a plant product used to make fabric. Cotton is made of cellulose, a fiber not digestible by humans. Cellulose is composed of many sugar molecules bonded together into long chains. Each sugar molecule contains carbon, hydrogen, and oxygen atoms.

When cotton fabric is washed, wrinkles often form. The clothing industry uses chemicals to manufacture some cotton fabrics that are wrinkle-free. Dyes are also added to color the cellulose fibers in cotton.

29 **A feature that is common to both cellulose and sugar is that both are**

- ○ **A** magnetic
- ○ **B** elements
- ○ **C** compounds
- ○ **D** soluble in water

30 **How would a clothing manufacturer separate colors to determine the purity of the dyes?**

- ○ **A** through filtration
- ○ **B** by their boiling points
- ○ **C** by their freezing points
- ○ **D** through paper chromatography

Part 3

31 **The data table below lists some of the properties of matter.**

PROPERTIES OF MATTER

	Cellulose	Sugar	Carbon	Hydrogen	Oxygen
Color	White	White	Dark	Colorless	Colorless
State of Matter	Solid	Solid	Solid	Gas	Gas
Reactivity	Stable	Stable	Reactive	Reactive	Reactive

How do the properties of the elements compare with the properties of cellulose?

- ○ **A** The physical and chemical properties of the elements are different from the physical and chemical properties of cellulose.
- ○ **B** The physical and chemical properties of the elements are the same as the physical and chemical properties of cellulose.
- ○ **C** The physical properties of the elements and cellulose are different, but their chemical properties are the same.
- ○ **D** The physical properties of the elements and cellulose are the same, but their chemical properties are different.

Part 3

32 **Science students investigated the cause of the different phases of the moon.**

The model that would best demonstrate the cause of the phases of the moon would include representations of

- ○ **A** the moon and Earth
- ○ **B** the moon and the sun
- ○ **C** the moon, the sun, and Earth
- ○ **D** the moon, the sun, and Venus

Part 3

33 **The surface of Earth is constantly changing.**

Which of these findings provides the best evidence that the crustal surface of Earth has changed over time?

- ○ **A** Some rock layers are very thick.
- ○ **B** Some species have become extinct.
- ○ **C** Marine fossils are found in mountain areas.
- ○ **D** Igneous rock is found on all tectonic plates.

Part 4

Part 4

Directions

Use the information below to answer Numbers 34 and 35.

Environmental scientists are studying a preserved wetland ecosystem and the effect of human population growth on that wetland. The scientists used the information below to develop an educational program.

FEATURES OF A WETLAND ECOSYSTEM

Year	Average Precipitation (centimeters)	Number of Trees	Number of Frogs
0	92	55	155
2	82	70	135
4	56	95	100
6	64	80	115
8	61	80	110
10	92	54	160

Part 4

34 **The frog population of the wetland declined from Year 0 to Year 4 and increased in Year 6.**

Which statement most likely explains the decline in the frog population?

- ○ **A** The life cycle of frogs is dependent on rainfall.
- ○ **B** The frogs moved to a wetland with fewer trees.
- ○ **C** Habitat destruction reduced the number of frogs.
- ○ **D** Competition with other species reduced the number of frogs.

Part 4

35 **Explain how environmental conditions affect the population cycles of wetland organisms. In your explanation, be sure to include**

- **the relationship between the amount of precipitation and the number of trees**
- **the relationship between the amount of precipitation and the number of frogs**

Part 4

Write your answer in the space provided.

Precipitation and Trees

Precipitation and Frogs

Part 4

36 **Glaciers cover about 10% of the total land area on Earth.**

The role of glaciers in the water cycle is to

- ○ **A** filter salt water
- ○ **B** store fresh water
- ○ **C** move liquid water
- ○ **D** precipitate solid water

Part 4

37 **A power plant uses chemical energy to produce electricity.**

What source of energy does the power plant most likely use?

- ○ **A** wind
- ○ **B** sunlight
- ○ **C** fossil fuel
- ○ **D** tidal waves

38 **Heat is applied to a beaker of water, raising the water temperature a few degrees.**

What happens to the water molecules after heat is applied?

- ○ **A** The molecules spread apart and move more slowly.
- ○ **B** The molecules spread apart and move more quickly.
- ○ **C** The molecules come together and move more slowly.
- ○ **D** The molecules come together and move more quickly.

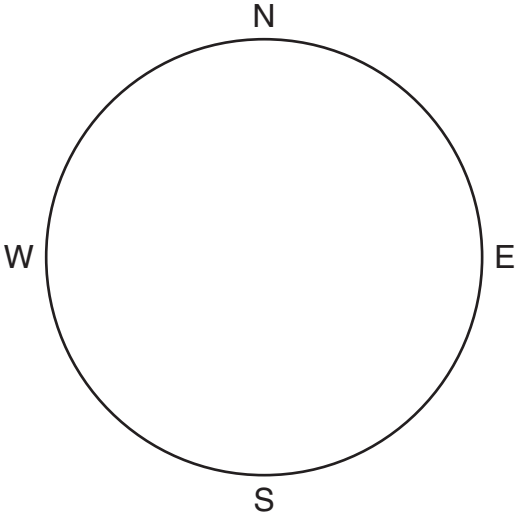
Part 4

Directions

Use the information below to answer Numbers 39 through 41.

A group of students investigated physics concepts at an ice-skating rink. The students skated at different speeds and pushed boxes across the ice. The boxes were exactly the same except for their mass.

ICE-SKATING RINK



MASS OF BOXES

Box	Mass (kilograms)
1	45
2	60
3	70
4	85

Part 4

39 **What type of force causes an ice skater to begin to move?**

- ○ **A** balanced
- ○ **B** gravitational
- ○ **C** magnetic
- ○ **D** unbalanced

40 **The data tables below show the times and distances traveled by two ice skaters.**

SKATER X

Time (seconds)	Distance Traveled (meters)
10	10
20	20
30	30
40	40
50	50
60	60

SKATER Z

Time (seconds)	Distance Traveled (meters)
10	10
20	25
30	50
40	85
50	125
60	200

Skater Z demonstrated what type of motion?

- ○ **A** uniform motion
- ○ **B** periodic motion
- ○ **C** constant motion
- ○ **D** accelerated motion

Part 4

41 **The perimeter of the skating rink is 75 meters. A student skates the perimeter of the rink 4 times in 5 minutes.**

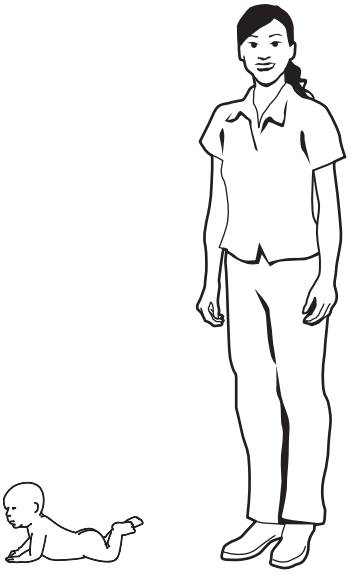
$$\text{average speed} = \frac{\text{distance traveled}}{\text{time interval}}$$

What is the average speed of the student in meters per second?

- ○ **A** 1 meter per second
- ○ **B** 15 meters per second
- ○ **C** 300 meters per second
- ○ **D** 375 meters per second

Part 4

42 **A human baby and adult are pictured below.**



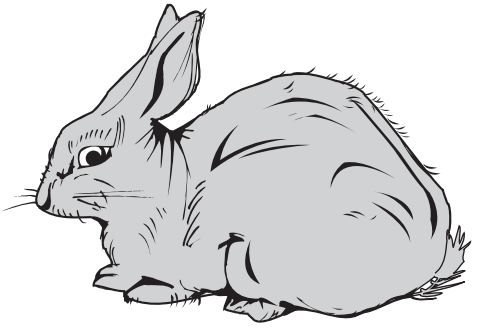
Which of the following processes enables the baby to become an adult?

- ○ **A** development of new genes
- ○ **B** genetic changes
- ○ **C** production of sex cells
- ○ **D** repeated cell divisions

Part 4

43 **As shown in the drawing below, snowshoe hares have thick white fur in the winter and thin gray fur in the summer. Changing fur color with the season provides a certain advantage to these animals.**

Snowshoe Hare in Winter



Snowshoe Hare in Summer

The advantage of changing fur color is that it

○ **A** helps hares to attract a mate

○ **B** allows hares to build soft dens

○ **C** helps hares to sneak up on prey

○ **D** allows hares to blend with the environment

Part 4

44 **Clams, oysters, and mussels eat plankton filtered from water.**

How would clams, oysters, and mussels most likely be affected if the amount of plankton in a large body of water was significantly reduced?

- ○ **A** They would increase in number.
- ○ **B** They would find a new food source.
- ○ **C** They would become prey to other animals.
- ○ **D** They would compete for a limited food source.

Acknowledgements

“Drilling to the Mantle.” Courtesy: National Science Foundation

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