

Maryland School

Assessment

Science

2011 Public Release

Grade 8

Part 1



Part 1

- 1** During sexual reproduction, a sperm cell fertilizes an egg cell to form a fertilized egg. The fertilized egg then develops into a new organism.

Which statement describes the primary advantage of sexual reproduction over asexual reproduction?

- A** Sexual reproduction produces identical offspring.
- B** Sexual reproduction results in less adaptable offspring.
- C** Sexual reproduction generates a large number of offspring.
- D** Sexual reproduction results in genetic variation in offspring.

- 2** One solar day on Jupiter lasts only 9 hours and 50 minutes.

What causes a solar day?

- A** diameter of the planet
- B** rotational speed of the planet
- C** speed of a planet in orbit around the sun
- D** diameter of the orbit of a planet around the sun

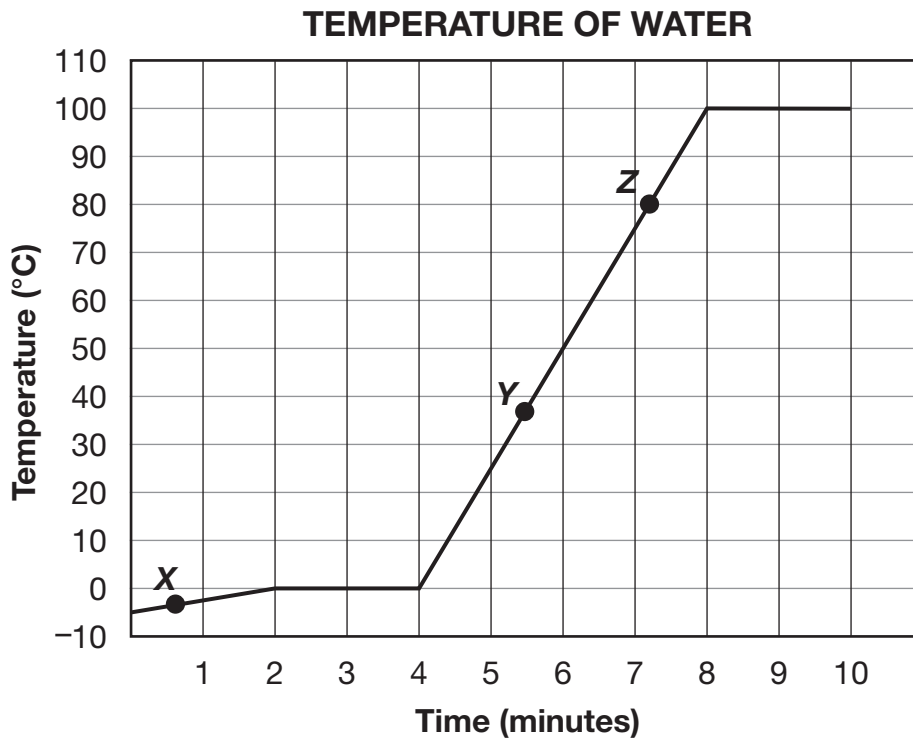
Part 1

Directions

Use the information and graph below to answer Numbers 3 and 4.

Heating Distilled Water

A group of students conducted an investigation. They placed 10 grams of ice at -5°C and a thermometer into a beaker. The students then placed the beaker on an electric hot plate and heated the beaker of ice for 10 minutes. The students read the thermometer every minute, recorded the temperature, and then constructed the graph below.



Part 1

3 The type of energy that most directly caused the ice in the beaker to melt was

- A** heat energy
- B** solar energy
- C** chemical energy
- D** electrical energy

4 Adding heat energy to the water in this investigation caused a

- A** physical change from a solid to a liquid
- B** physical change from a liquid to a solid
- C** chemical change from a solid to a liquid
- D** chemical change from a liquid to a solid



Part 1

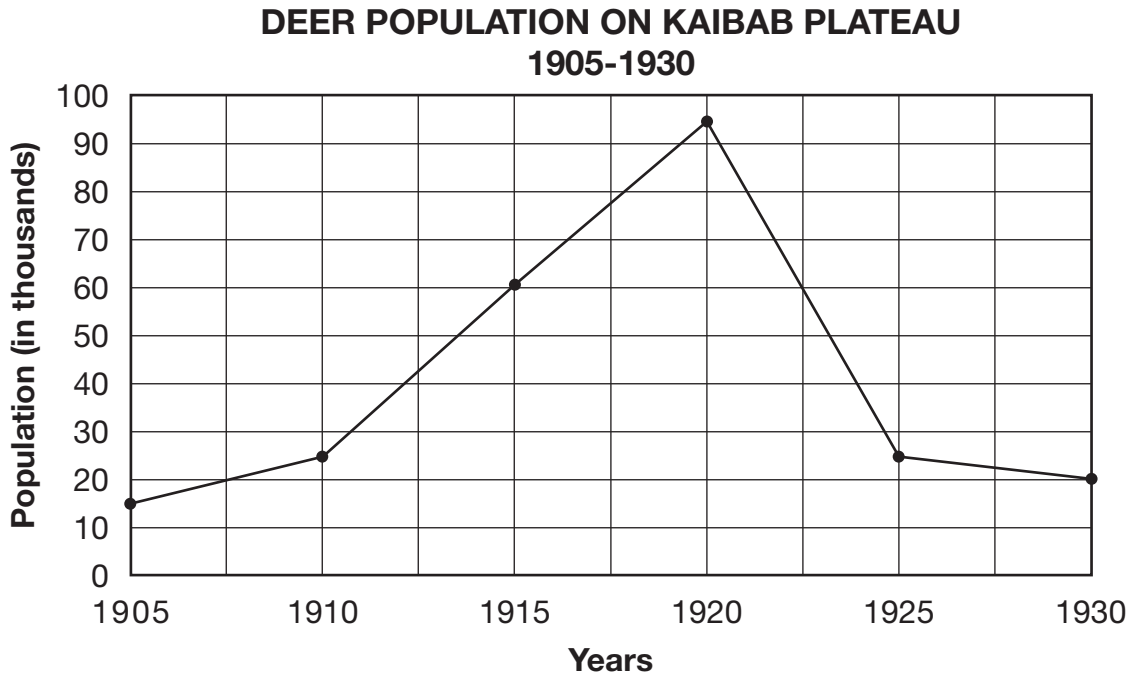
- 5** Bats send out high-pitched sounds each second. The sounds bounce off nearby objects and return to the bats. The strength of the returning signal and the amount of time the signal takes to return to the bats tell them the size, distance, and motion of nearby objects.

Explain why a physicist interested in sound waves and a biologist interested in bat populations would work together to study bats. In your explanation, be sure to include

- how the physicist's research might help the biologist
- how the biologist's research might help the physicist

Part 1

- 6 In the early 1900s, an effort was made to protect the deer population that lived on the Kaibab Plateau in Arizona. Over 6200 predators of the deer were hunted.



The best explanation for the increase in the deer population on the Kaibab Plateau is that the deer had

- A less exposure to diseases
- B a more favorable climate
- C an unlimited food supply
- D fewer natural enemies

Part 1

- 7 The brown tree snake is a nonnative species found on the South Pacific island of Guam. The brown tree snake population in Guam is so large that it negatively affects the humans there.

Which statement best explains why the brown tree snake has flourished in Guam?

- A There are many animals for food.
- B There are no natural snake predators.
- C The climate is ideal for snake reproduction.
- D The vegetation provides good habitat for hunting.

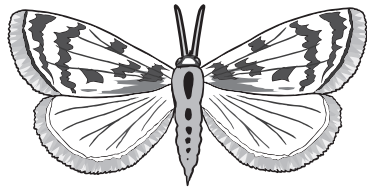


Part 1

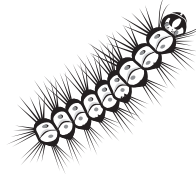
Directions

Use the information below to answer Numbers 8 and 9.

The gypsy moth was accidentally brought into the United States. The caterpillars of these moths eat the leaves of hardwood trees. Eating these leaves decreases the growth of the trees and may cause the trees to die. A gypsy moth and gypsy moth caterpillar are pictured below.



Gypsy Moth



Gypsy Moth Caterpillar

Part 1

8 Why do gypsy moth caterpillars eat leaves?

- A** to destroy the hardwood tree
- B** to extract energy for growth
- C** to obtain trapped oxygen
- D** to produce their own food

9 How would an increase in the number of gypsy moth caterpillars affect an environment?

- A** Air temperatures would decrease.
- B** Tree populations would decrease.
- C** The diversity of trees would increase.
- D** The amount of oxygen in the air would increase.



Part 1

10 The crust, the mantle, and the core are structures of Earth.

Which description is a feature of Earth's mantle?

- A** contains fossil remains
- B** consists of tectonic plates
- C** is located at the center of Earth
- D** has properties of both liquids and solids

11 Two identical books are placed on a bookshelf. Book 1 is on a shelf one meter above the floor and Book 2 is on a shelf two meters above the floor.

Which statement best compares the potential energy of the books?

- A** Book 2 has half as much potential energy as Book 1.
- B** Book 2 has twice as much potential energy as Book 1.
- C** Book 1 has twice as much potential energy as Book 2.
- D** Book 1 has four times as much potential energy as Book 2.

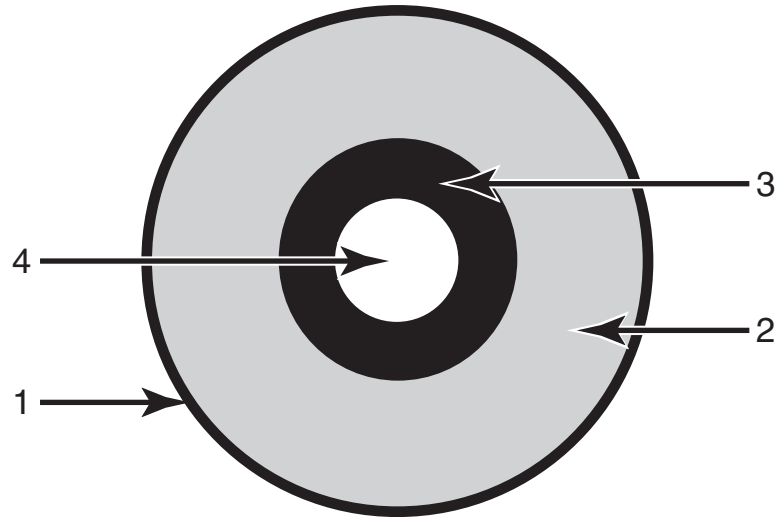


Part 2



Part 2

12 The diagram below shows a cross section of Earth.



Which numbered part of the diagram represents the mantle of Earth?

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

Part 2

- 13** The need for farmland in Brazil has led to the cutting of the rain forests in the Amazon.

Cutting trees in the Amazon rain forest might have a global effect by

- A** decreasing the amount of fresh water
- B** increasing the number of animal species
- C** decreasing the average yearly temperatures
- D** increasing carbon dioxide levels in the atmosphere



Part 2

Directions

Use the information and map below to answer Numbers 14 and 15.

Tropical Rain Forests

Tropical rain forests are located near the equator and have hot, wet climates. The tropical rain forests are home for over half of the plants and animals on Earth. The tropical rain forests in many areas are being destroyed and the land is being used for other purposes. The shaded areas on the map indicate the location of tropical rain forests.

LOCATION OF TROPICAL RAIN FORESTS



Part 2

14 Which issue most likely results from cutting down tropical rain forests?

- A** Habitats for many species are destroyed.
- B** Crops are more difficult to grow and harvest.
- C** Roads and houses are more difficult to build.
- D** Soil quality increases in the deforested areas.

15 Removing trees from a rain forest changes the habitat for many species by

- A** decreasing the temperature
- B** decreasing the protective cover
- C** increasing the oxygen levels
- D** increasing the food supply



Part 2

Directions

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

Putting the Squeeze on Toothpaste

Every year, toothpaste companies spend millions of dollars looking for ways to make products that taste better, make your teeth cleaner, and keep you coming back for more.

“Toothpastes are always evolving, always improving,” says David Weitz, a physicist at Harvard University in Cambridge, Mass.

Squishy Physics

Before any new type of toothpaste hits store shelves, scientists put it through a battery¹ of tests. Companies want to make sure that their toothpastes survive such factors as temperature changes during manufacture, transportation, storage, and finally, brushing.

Each toothpaste is a finely blended mixture of liquids and small, sandy particles. Called abrasives, these particles scrub the grime off your teeth and make them white.

Pastes are technically solids, but they’re a little more complicated than that. When you squeeze a tube of toothpaste, for example, the parts of the paste next to the tube’s wall liquefy,² allowing the solid center to flow out.

The particles in a paste are heavier than the other ingredients are, but somehow they don’t sink to the bottom. That’s because molecules within the mixture form a network³ that holds everything in place.

Weitz says, “It’s a network that supports itself. We’re interested in understanding how it does that.”

Tweaking Formulas

The question of toothpaste’s structure is especially important because companies are always tweaking⁴ the formulas of their products. And with every new ingredient added, there’s a risk that the structure might be disturbed and that paste might fall apart.

Part 2

In the interest of keeping toothpastes in one piece, scientists measure the strength of bonds between particles. This information indicates how long the ingredients will stay mixed.

For the most part, researchers have found, toothpastes are very stable. It takes a long time for them to separate into layers.

There's an easy way to destabilize⁵ toothpaste, however, and it's something you do every day. After a few vigorous brushes, toothpaste turns into a liquid that you can swish around and spit out.

"One of the big developments in the field has been the recognition that there's a tremendous similarity between putting a force on a paste and waiting a long time," Weitz says. Both actions, in other words, tend to destabilize a paste.

One major research goal is to make pastes that last even longer.

¹**battery** – series

²**liquefy** – change to a liquid

³**network** – connected group

⁴**tweaking** – making a small change

⁵**destabilize** – break apart

- 16** Prior to examining a tube of toothpaste that was open for many years, a student predicted that there would be only a solid remaining in the tube.

The student most likely made this prediction because

- A** toothpaste is a mixture
- B** toothpaste is mostly water
- C** all the toothpaste would be gone
- D** all the liquids would have evaporated

Part 2

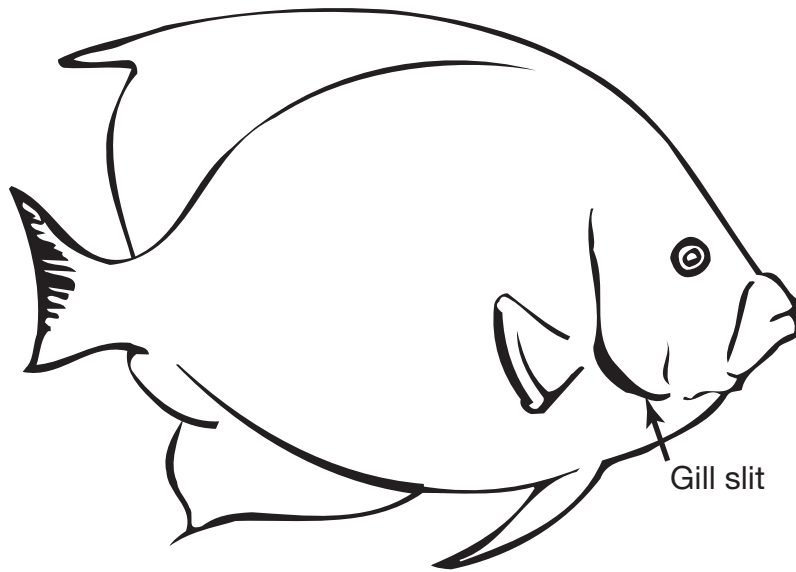
- 17 The friction caused by the abrasives in the toothpaste moving across a person's teeth generates a small amount of heat energy.

Which process would transfer most of the heat energy to the toothbrush?

- A conduction
- B convection
- C radiation
- D refraction

Part 2

- 19 Students observed that fish in an aquarium opened and closed their gill slits faster on Thursday than on the previous Monday. Some students hypothesized that warmer water caused the change in gill slit movement. Other students hypothesized that dirtier water caused the change in gill slit movement.



Both hypotheses are valuable because they

- A are reasonable and testable
- B compare independent variables
- C are the only explanations possible
- D link temperature with water quality

Part 2

Directions

Use The Periodic Table of the Elements and the information below to answer Numbers 20 and 21.

A student analyzed the data that identified the properties of an unknown element, Element X, to determine if the element was a metal or a nonmetal.

ELEMENT X DATA SHEET

Property	Result
Color	Gray-white
Luster	Shiny
Flexibility	Yes
Melting point	39°C
Boiling point	688°C
Reacts with oxygen	Yes; burns
Reacts with chlorine	Yes; burns
Atomic mass unit	85.5 AMU



Part 2

20 Which statement best describes the motion of atoms in Element X at 800°C?

- A** The atoms move slowly and are far apart.
- B** The atoms move quickly and are far apart.
- C** The atoms move slowly and are close together.
- D** The atoms move quickly and are close together.

21 Which word best describes the substance that is formed when Element X reacts with chlorine?

- A** compound
- B** element
- C** mixture
- D** solution

Part 2

- 22 Equal force is applied to a baseball, a basketball, a tennis ball, and a bowling ball.

Type of ball	Typical Mass (grams)
Baseball	142
Basketball	575
Tennis ball	56
Bowling ball	4,500

Which ball will have the greatest change in motion?

- A a baseball
- B a basketball
- C a tennis ball
- D a bowling ball



Part 3



Directions

Use the information below to answer Numbers 23 and 24.

The Goldilocks Zone

Scientists report they have found a new planet that is similar to Earth. The planet revolves around the star Gliese 581, one of the closest stars outside our solar system. Data collected over a number of years shows that Gliese 581 wobbled. This wobble indicates that a planet is orbiting the star. The orbit appears to last about 13 Earth days. The planet is in a region the scientists call The Goldilocks Zone. This zone is at a distance from Gliese 581 where temperatures on the planet range from 0°C and 40°C . These temperatures suggest that the planet has some conditions similar to those on Earth.



Part 3

23 The amount of time in one day on the new planet would be determined by

- A its radius
- B the tilt of its axis
- C its period of rotation
- D the cycle of its moons

24 Scientists want to determine if the new planet has seasons that are similar to the seasons on Earth.

Which information will most likely help the scientists make this determination?

- A the age of Gliese 581
- B the tilt of the axis of the planet
- C the number of planetary moons
- D the surface temperatures of Gliese 581

25 All animals need food to survive.

Immediately after an animal eats food, the food is

- A** stored for later use
- B** converted into waste
- C** transported by the bloodstream
- D** digested into simpler substances



Directions

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

Good Vibrations: How Termites Know What's For Dinner

Termites may be blind, but they can still tell if your house would make a tasty dinner based on the “musical” good vibrations wood makes as they chomp¹ on it.

Because termites can't smell, taste or even see their food, researchers wondered how they knew what they were eating, especially since they seemed to be fairly sophisticated² in their choices.

“If you give them a large block of wood and a small block of wood, they'll actually be able to tell the difference. And the question is, how do they do that? . . . and the answer came as vibrations,” said Ra Inta, an entomologist³ with the Commonwealth Scientific and Industrial Research Organization (CSIRO).

As termites grip and pull wood fibers, the fibers snap and “send a small impulse through the entire structure that they're eating,” Inta said.

Those vibrations return to the termites and let them know what they're eating.

The researchers found that they could manipulate⁴ the termites' tastes by generating false vibrations.

“When you record their feeding in a large block of wood, which they normally prefer, and you play it through a small block of wood, their feeding preference will actually change,” Inta said. “It appears to them that the block of wood is actually larger.”

Ina still has to figure out what exactly the insects are responding to in the vibration signals and how they distinguish between different types of materials.



Part 3

“If we can understand what they assess⁵ and what they prefer in the vibration signal, then we can make use of whatever is in that signal to manipulate their behavior,” Inta said. “So we can try and get them away from your house to somewhere else, or we can get them away from your house altogether.”

¹**chomp** – chew

²**sophisticated** – advanced

³**entomologist** – scientist who studies insects

⁴**manipulate** – control

⁵**assess** – judge

26 Which example of energy transfer is most similar to the energy transfer that termites detect in wood?

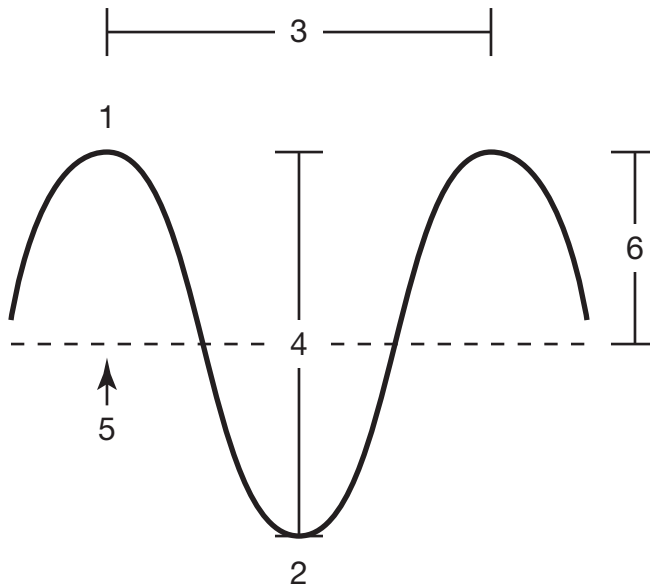
- A** heat from an oven warming a kitchen
- B** light from a lamp powering a solar calculator
- C** electricity from a battery making a flashlight glow
- D** sounds from a guitar string striking a person’s eardrum

27 The best example of energy transfer in waves is

- A** a cold wind blowing leaves
- B** an engine supplying power
- C** an earthquake shaking buildings
- D** a hot stove directly warming a pan

Part 3

28 A group of students investigated the properties of vibration waves.



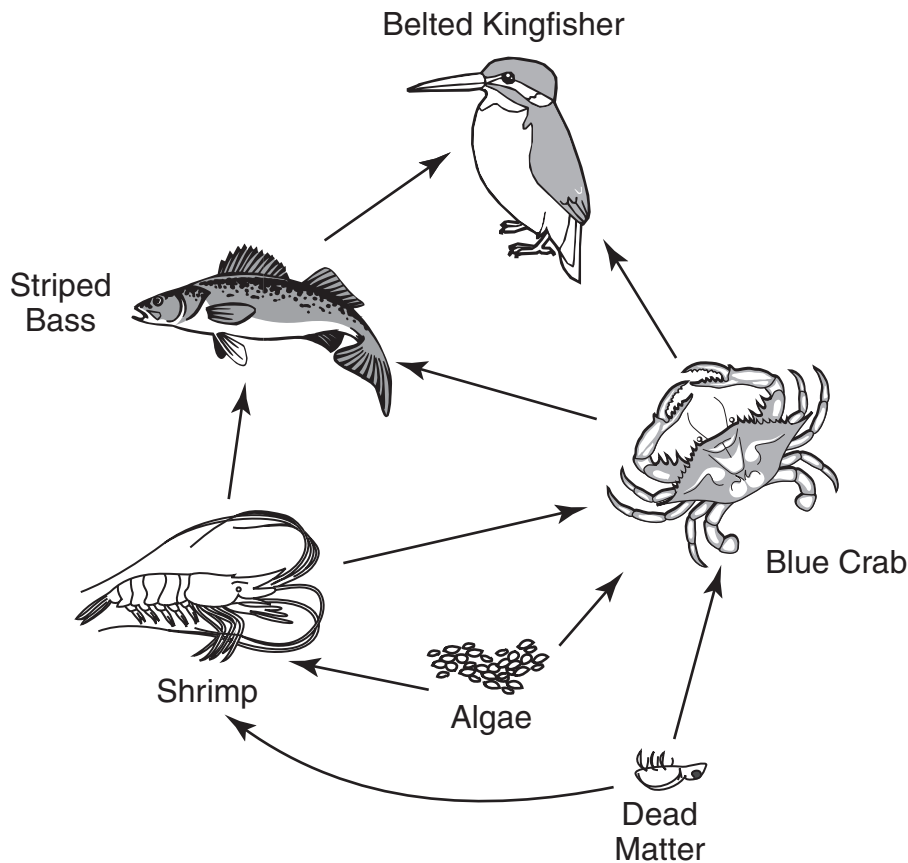
Describe the characteristics that are common to all vibration waves. In your description, be sure to include

- the identity of each numbered area in the diagram
- how a change in frequency would affect the relationship between numbered areas 1 and 3

Part 3

- 29 Students studied the relationship among organisms in a wetland environment.

WETLAND FOOD WEB



Which type of interaction exists between shrimp and blue crabs in this food web?

- A Shrimp prey on blue crabs.
- B Shrimp compete with blue crabs for food.
- C Shrimp help blue crabs filter polluted water.
- D Shrimp decompose matter for blue crabs.

Part 3

Directions

Use the information below to answer Numbers 30 through 32.

Pine trees are vascular plants. There are more than 100 species of pine trees. The loblolly pine is native to Maryland and is found in forests near the Chesapeake Bay. This tree grows rapidly. An interesting feature of the loblolly pine tree is the presence of both male and female structures on one tree. The loblolly pine is a member of a group of cone-bearing plants called conifers. These plants do not produce flowers. The conifers slowly separated from a group of flowering plants approximately 100,000,000 years ago.



Part 3

30 Which life function occurs primarily in the roots of a loblolly pine tree?

- A reproduction
- B food production
- C water absorption
- D sunlight collection

31 What most likely resulted in the separation of the conifer group from the flowering plant group?

- A a sudden climate change
- B a gradual decrease in insect populations
- C a gradual increase in genetic differences
- D a sudden decrease in the amount of available sunlight

32 Loblolly pine trees usually reproduce sexually when pollen from a male structure fertilizes a female structure on a different tree.

What percentage of genetic information is contributed by the pollen of the male structure?

- A 25%
- B 50%
- C 75%
- D 100%



33 Students combined baking soda and vinegar to demonstrate a chemical reaction.

What indicates that a chemical reaction occurred?

- A** the formation of bubbles
- B** a reduction in total mass
- C** the disappearance of atoms
- D** an increase in the number of atoms





Part 4



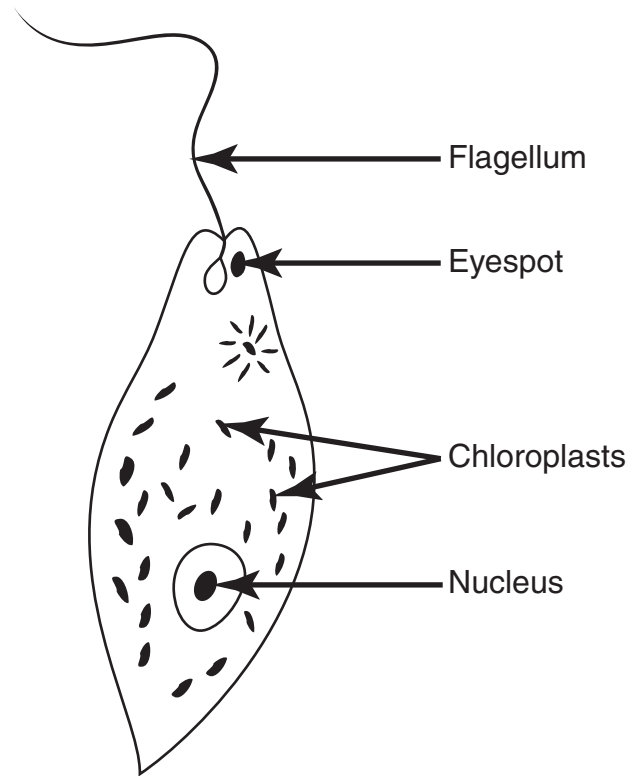
34 Data indicate that chemical pollutants contaminate 53% of the waterways that empty into the Chesapeake Bay. These chemical pollutants are found in the tissues of animals living in the bay.

Which group of people who live away from the bay might be most affected by these chemical pollutants?

- A people who walk near the bay
- B people who read books about the bay
- C people who consume fish from the bay
- D people who own boats docked in the bay



- 35 Organisms that have physical features common to both plants and animals are difficult to classify. The diagram below shows physical features of a euglena.



Which euglena feature caused some scientists to classify the euglena as a plant?

- A chloroplast
- B eyespot
- C flagellum
- D nucleus

Directions

Use the information below to answer Numbers 36 and 37.

Our solar system consists of the sun, planets, moons, and other objects. Each planet revolves around the sun and rotates on an axis. A data table comparing the four inner planets of the solar system is shown below.

FOUR INNER PLANETS

Planets	Average Distance from the Sun (kilometers)	Time to Complete One Rotation (hours)
Mercury	57,700,000	1,407.5
Venus	108,500,000	5,832
Earth	149,000,000	24
Mars	227,000,000	24.6

36 Which planet has the longest solar day?

- A** Mercury
- B** Venus
- C** Earth
- D** Mars

37 Which planet takes the most time to revolve around the sun?

- A** Mercury
- B** Venus
- C** Earth
- D** Mars

39 A light bulb transforms electrical energy into light energy.

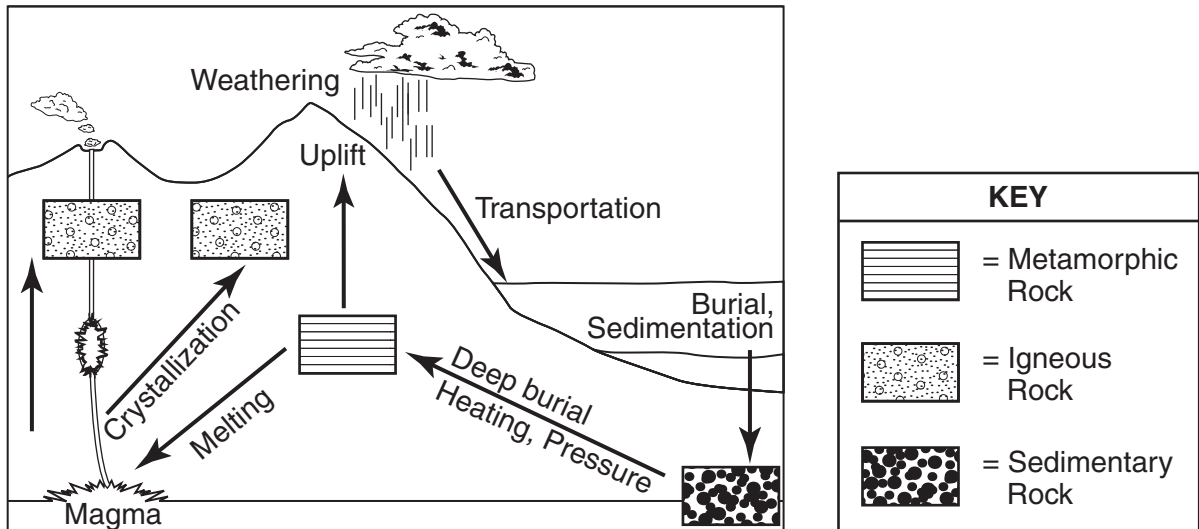
A light bulb also transforms electrical energy into

- A** heat energy
- B** potential energy
- C** magnetic energy
- D** mechanical energy

Directions

Use the information below to answer Numbers 40 through 42.

The diagram below shows how rocks are formed.



40 Layers of sedimentary rocks are exposed in a deep canyon. A geologist finds fossils of shelled animals within these layers.

The geologist can best conclude that the canyon area was once

- A covered by an ocean
- B part of a mountain range
- C in a tropical environment
- D home to many volcanoes

41 What two processes can change sedimentary rock into metamorphic rock?

- A melting and uplifting
- B melting and pressing
- C heating and pressing
- D heating and crystallizing

42 Fossils found in layers of sedimentary rocks help scientists understand

- A why volcanoes exist
- B why rocks are formed
- C how igneous rocks are made
- D how species change over time

43 A scientist reads about an experiment conducted by a researcher. The scientist conducts the same experiment and collects data but this data contradicts what was published by the researcher.

What should the scientist do since the data from the two experiments is contradictory?

- A** Repeat the experiment to check the data collected.
- B** Contact the researcher who first performed the experiment.
- C** Contact the scientific journal that published the experiment.
- D** Disregard the data collected since the experiment was published.

44 Garrett State Forest occupies 1700 acres and is the birthplace of forestry conservation in Maryland. An ecologist counts the number of white oak trees in a 20-by-100 meter area of Garrett State Forest.

Why is this white oak tree count not representative of the number of white oak trees in Garrett State Forest?

- A** The count was conducted only once.
- B** The count was conducted by a single individual.
- C** The count represents a single small section of the forest.
- D** The count should include other trees found in the sample area.

Acknowledgements

“Putting the Squeeze on Toothpaste” from *Science News for Kids*, November 29, 2006. Reprinted with Permission of Science News for Kids.

“Good Vibrations: How Termites Know What’s For Dinner” by Andrea Thompson, http://www.livescience.com/animals/070326_termite_vibes.html, Imaginova Corp.