

Maryland School

Assessment

Science

2010 Public Release

Grade 8

Part 1



Part 1

1 Electrical energy may sometimes be converted to mechanical energy.

Which of these appliances converts electrical energy into mechanical energy?

- A** fan
- B** lamp
- C** radio
- D** stove

Part 1

Directions

Use the technical passage below to answer Numbers 2 through 4.

Fireflies

FLASH . . . flash, flash . . . FLASH. Tiny lights are sending out a message in code: “Hey, I’m over here. I’m female.” The pattern of flashes also identifies the firefly’s species. And by the way, this insect isn’t a fly of any kind; it’s actually a beetle.

In the night sky, a male firefly of the same species spots the lights and flashes back: “Message received. I’m coming. I’m coming.” Both partners repeat their messages until the male reaches the female and they mate.

Not all species of fireflies—also called lightning bugs—twinkle, but many of them do. They change chemical energy into light energy, and they’re very efficient at it. Unlike the bulb in your desk lamp, fireflies make light that is almost heat-free. In many species, the light-making organ sits near the end of the abdomen—a taillight of sorts. Some fireflies also produce light in the middle section of their bodies.

Many female flashers are wingless and earthbound, but these glowworms—as they’re sometimes labeled—can twist their bodies around to send their coded messages in different directions. Some also deliver false signals, luring males of different species, then eating them!

Even firefly larvae—also called glowworms—can glow. Scientists think the larvae might use their “taillights” as a warning: “Yucky tasting. Do not eat.” Many larvae spend about two years living in soil, rotten wood, or leaf litter, where they gobble up food such as worms, snails, and slugs. Then each one builds a dirt ball around itself and emerges a week or two later as an adult.

Most grown fireflies live less than three weeks. During that time, some of them feed, and some of them don’t, but they all try to mate. Then the species that twinkle put on quite a show. FLASH . . . flash, flash . . . FLASH.



Part 1

2 The light produced by fireflies indicates

- A** a physical change
- B** a chemical reaction
- C** the formation of water
- D** the formation of precipitate

3 How does the light produced by the firefly help it to survive?

- A** Light distracts predators.
- B** Light keeps the firefly warm.
- C** Light allows the firefly to communicate.
- D** Light allows the firefly to see in the dark.

Part 1

Directions

Use the information and table below to answer Numbers 5 through 7.

The table below compares Earth and Saturn.

EARTH AND SATURN

| Feature | Earth | Saturn |
|-------------------------------------|------------------|-------------------|
| Size | Small | Giant |
| Amount of time in a solar day | 24 hours | 10.2 hours |
| Amount of time to complete an orbit | 1 Earth year | 29.5 Earth years |
| Tilt of axis | 23.5° | 27° |
| Composition | Composed of rock | Composed of gases |

5 Which statement best compares Saturn and Earth?

- A** Saturn is more dense than Earth.
- B** Saturn has fewer lunar eclipses than Earth.
- C** Saturn has a longer day and night cycle than Earth.
- D** Saturn takes more time to revolve around the sun than Earth.

Part 1

6 The amount of time in a day on Saturn is less than the amount of time in a day on Earth because Saturn

- A** has a shorter axis
- B** has a more tilted axis
- C** rotates more slowly on its axis
- D** rotates more quickly on its axis

7 Earth and Saturn are tilted on their axes at similar angles.

What feature of both planets do the angles affect?

- A** different seasons
- B** prevailing wind direction
- C** average atmospheric pressure
- D** average atmospheric temperature



Part 1

8 Many organisms have structures for protection and survival.

Which structure is most similar to tree bark?

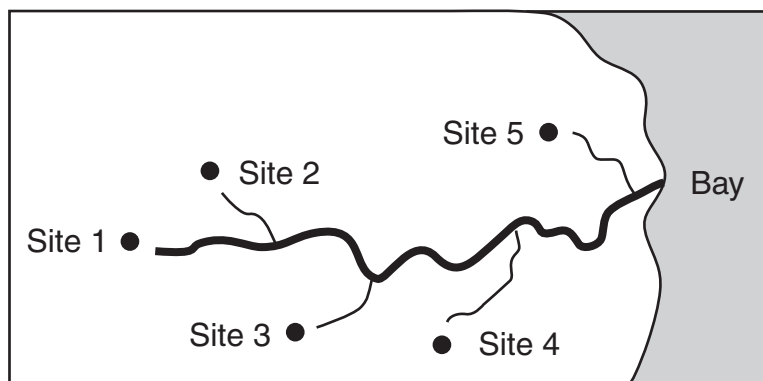
- A** bird beak
- B** bear claws
- C** human skin
- D** snake fangs

Part 1

Directions

Use the information below to answer Numbers 9 through 11.

Students studied the water quality at five different sites in a water drainage area. The water from the five streams and river sites empties into a bay. The students recorded data for dissolved oxygen, percentage of floating sediments, water quality for aquatic life, temperature, and salinity. The information is shown in the data table below.



WATER QUALITY AT FIVE SAMPLE SITES

| Site | Dissolved Oxygen (milligrams per liter) | Percentage of Floating Sediments (%) | Water Quality for Aquatic Life | Temperature (°C) | Salinity (parts per thousand) |
|------|---|--------------------------------------|--------------------------------|------------------|-------------------------------|
| 1 | 7.0 | 5 | Good | 11.0 | 0.1 |
| 2 | 6.3 | 15 | Good | 13.0 | 0.5 |
| 3 | 4.7 | 20 | Moderate | 19.0 | 7.0 |
| 4 | 3.1 | 70 | Poor | 26.6 | 14.0 |
| 5 | 3.7 | 15 | Moderate | 24.0 | 15.0 |

Part 1

9 Based on the data in the table, how do high sediment levels reduce water quality for aquatic life?

- A** increase the salinity
- B** decrease the temperature
- C** decrease dissolved oxygen
- D** increase the amount of carbon dioxide

10 A manufacturing power plant at Site 4 releases high temperature wastewater into the river.

How would this power plant affect the natural processes of the river?

- A** The water quality for aquatic life would increase.
- B** The amount of dissolved oxygen would decrease.
- C** The population of aquatic life would stay the same.
- D** The amount of salt dissolved in the water would stay the same.

Part 1

- 11 The data table below shows information collected from four water samples.

| Water Sample | Percentage of Nitrogen (%) | Algae Growth After 30 Days (grams) | Dissolved Oxygen (milligrams per liter) |
|----------------|----------------------------|------------------------------------|---|
| Control sample | 0 | 2.2 | 7.0 |
| X | 10 | 10.5 | 6.2 |
| Y | 15 | 12.3 | 4.5 |
| Z | 18 | 16.5 | 3.2 |

Which of the following relationships is reflected by the data above?

- A When nitrogen increases, algae growth increases.
- B When nitrogen decreases, algae growth increases.
- C When nitrogen increases, dissolved oxygen increases.
- D When nitrogen decreases, dissolved oxygen decreases.



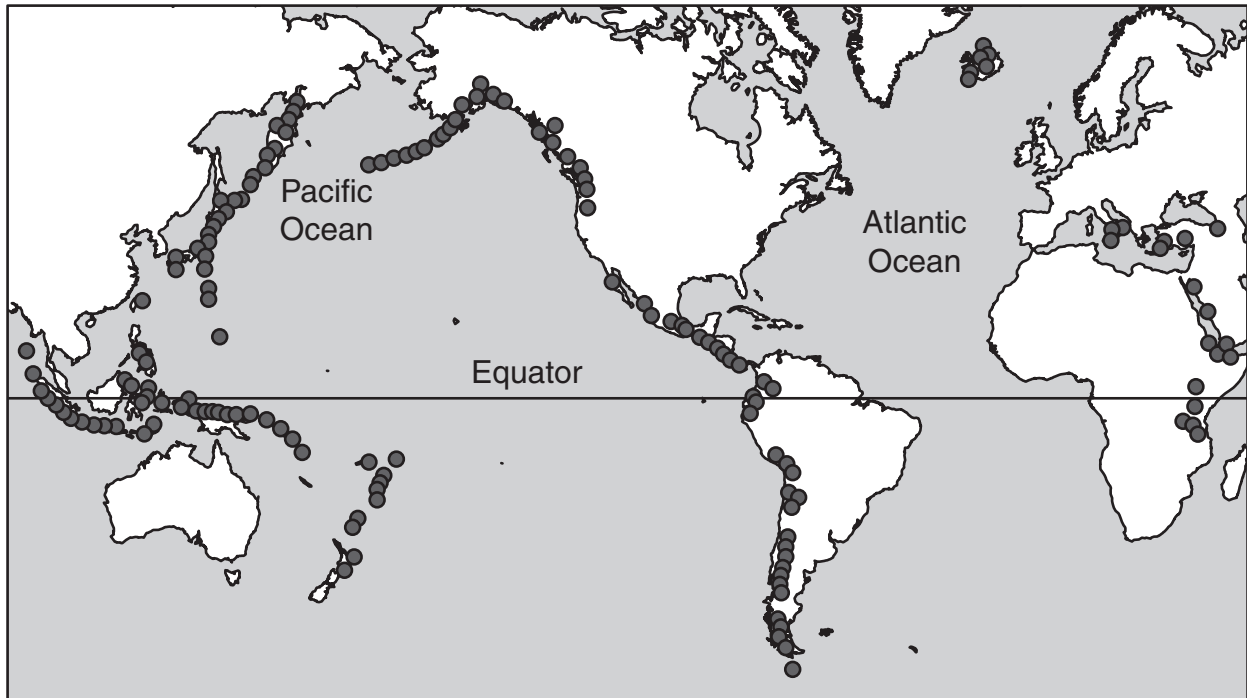
Part 2



Part 2

12 The map below shows areas with active volcanoes.

LOCATIONS OF ACTIVE VOLCANOES



KEY

● = Active volcano

Where are most of the active volcanoes located?

- A along the equator
- B in the middle of the oceans
- C on tectonic plate boundaries
- D at the center of the continents



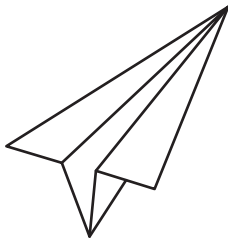
Part 2

Directions

Use the information below to answer Numbers 13 through 15.

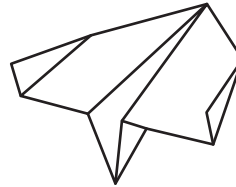
Students investigated how the design of a paper airplane affects the amount of time the airplane stays in the air and the distance the airplane travels. The students tested two airplane designs and kept all other variables constant. The students recorded their data in the tables below.

AIRPLANE Y



Long and Narrow

AIRPLANE Z



Short and Wide

DISTANCE AIRPLANES TRAVELED

| Airplane | Trial 1 | Trial 2 | Trial 3 |
|----------|-----------------|-----------------|-----------------|
| Y | 600 centimeters | 550 centimeters | 800 centimeters |
| Z | 150 centimeters | 175 centimeters | 105 centimeters |

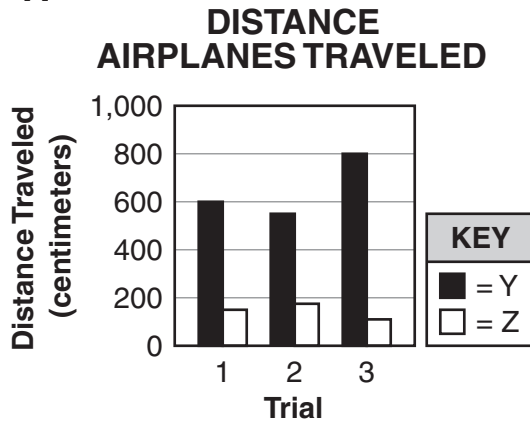
TIME AIRPLANES WERE IN THE AIR

| Airplane | Trial 1 | Trial 2 | Trial 3 |
|----------|-----------|-----------|-----------|
| Y | 3 seconds | 2 seconds | 4 seconds |
| Z | 2 seconds | 7 seconds | 6 seconds |

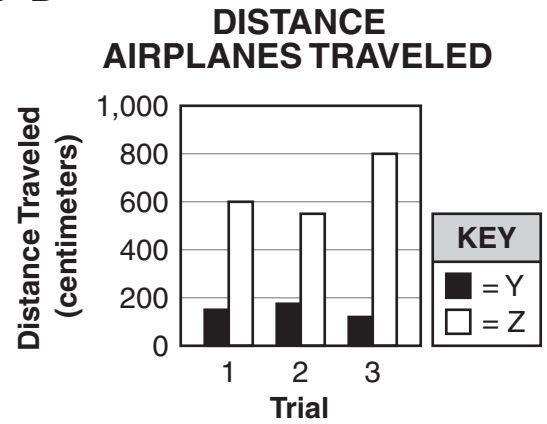
Part 2

13 Which graph best represents the data for distance traveled?

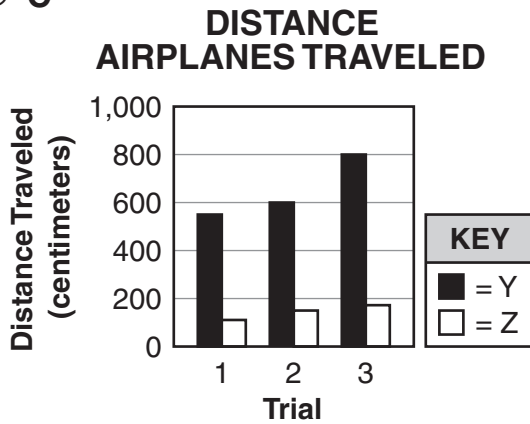
A



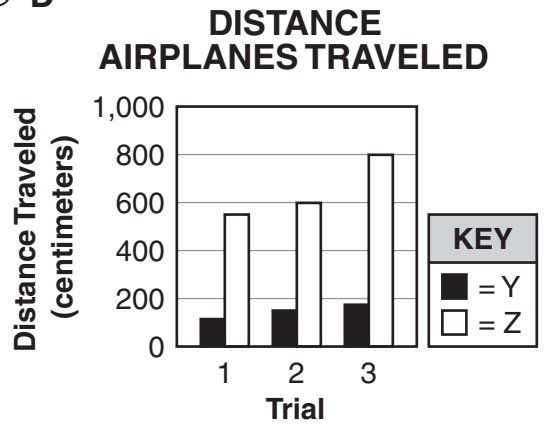
B



C



D



Part 2

14 Which conclusion is most logical, based on the data?

- A** A short and wide airplane travels a greater distance than a long and narrow airplane.
- B** A long and narrow airplane travels the same distance as a short and wide airplane.
- C** A long and narrow airplane remains in the air the same amount of time as a short and wide airplane.
- D** A short and wide airplane remains in the air a greater amount of time than a long and narrow airplane.

15 After Trial 1, a group of students decided that Airplane Y would travel farther and stay in the air a greater amount of time than Airplane Z.

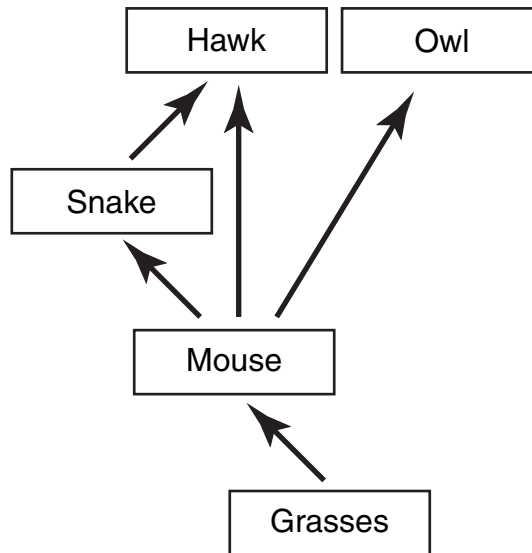
Which is the best scientific reason the students should repeat the trial at least three times?

- A** to follow the teacher's instructions
- B** to reduce the likelihood of a design defect
- C** to change the unit of measurement for distance
- D** to reduce the likelihood of inaccurate results



Part 2

16 The diagram below represents a simple food web.



Based on the diagram, which population most likely would benefit from a sharp decline in the mouse population?

- A grasses
- B hawk
- C owl
- D snake

Part 2

17 An object is moving in a straight line at a constant speed.

What will happen to the object if no outside force acts on the object?

- A** The speed and direction of the object will change.
- B** The speed and direction of the object will not change.
- C** The direction of the object will change; the speed will remain constant.
- D** The speed of the object will change; the direction will remain constant.



Part 2

- 18** Human bodies have complex structures that support growth and survival.

What is the most basic structure of the human body that supports growth and survival?

- A** a cell
- B** a tissue
- C** an organ
- D** an organ system



Part 2

Directions

Use the information below to answer Numbers 19 and 20.

Matter can be classified as an element, a compound, or a mixture. The elements sodium (Na) and chlorine (Cl) react with each other to form the compound sodium chloride (NaCl), also known as table salt. The reaction between sodium and chlorine releases energy. This energy causes the temperature of the substances in the reaction to increase. When table salt dissolves in water a solution is formed, which is a type of mixture.

19 Which of these changes must happen for elements to become a compound?

- A** elements are heated
- B** a gas becomes a liquid
- C** elements dissolve in water
- D** chemical bonds form between atoms



Part 2

- 20 A reaction between 46 grams of sodium and 71 grams of chlorine formed table salt and heat.

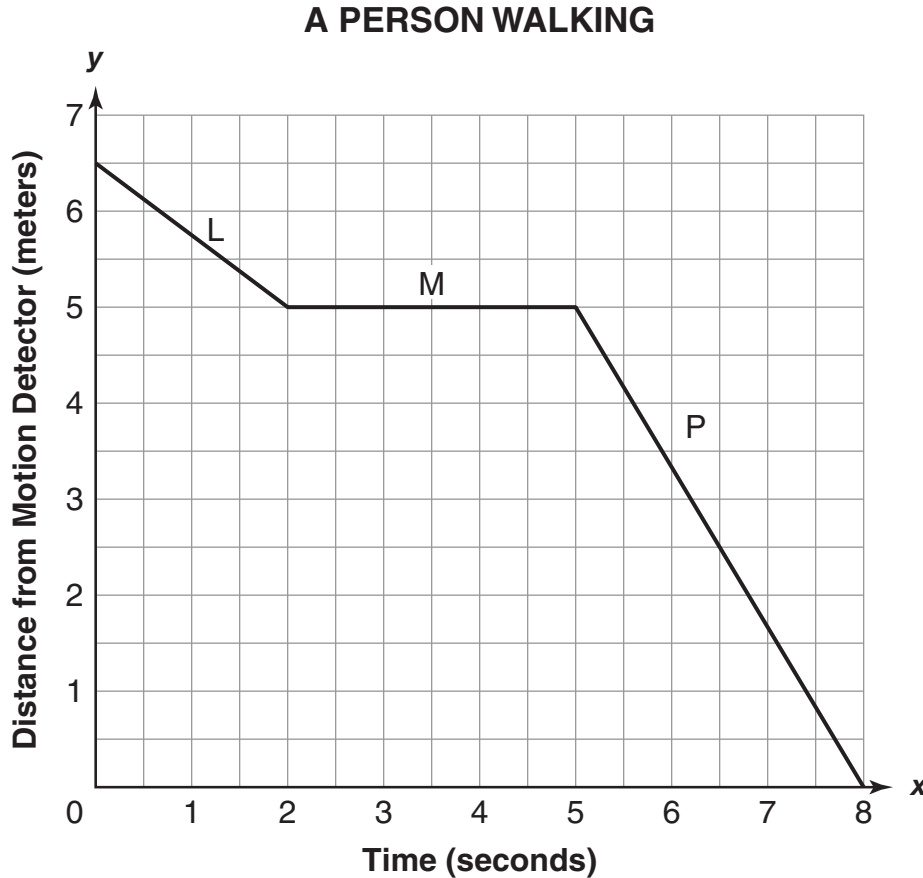
Which of the following measurements would most likely be the mass of the table salt?

- A 25 grams
- B 71 grams
- C 110 grams
- D 117 grams



Part 2

- 21 Students measured the movement of a person with a motion detector. Their data is shown on the graph below.



Describe the movement indicated by the motion detector from 0 seconds to 8 seconds. In your description, be sure to include

- the distance traveled and the time elapsed for each labeled section
- a comparison of the velocity in each section

Part 2

Write your answer in the spaces provided.

Section labeled L

Section labeled M

Section labeled P

Part 2

- 22** Excess nitrogen fertilizers sometimes drain into waterways that flow into the Chesapeake Bay. This nitrogen may cause algae blooms, which reduce dissolved oxygen in the water.

How does nitrogen negatively affect the Chesapeake Bay?

- A** fish births increase
- B** fish populations decrease
- C** sediment on the bottom of the bay decreases
- D** the rate of water runoff into the bay increases



Part 3

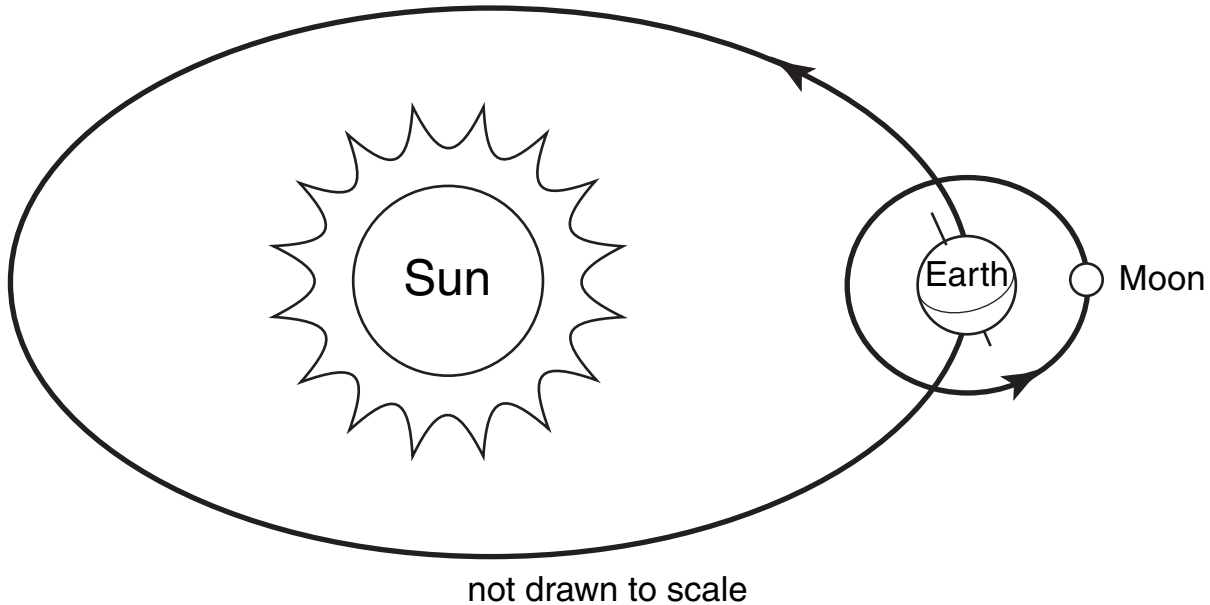


Part 3

Directions

Use the information below to answer Numbers 23 through 25.

The diagram below represents the relationship among Earth, the sun, and the moon.



- 23** According to the diagram, the rays from the sun are striking the Northern Hemisphere.

What season does this represent in the Northern Hemisphere?

- A fall
- B spring
- C summer
- D winter



24 Which statement best describes the orbit of Earth around the sun?

- A** Earth's orbit is elliptical.
- B** Earth's orbit is irregularly-shaped.
- C** Earth's orbit takes about 30 days to complete.
- D** Earth's orbit takes about 24 hours to complete.

25 Venus is about $\frac{3}{4}$ the distance that Earth is from the sun.

Which of the following units of time best identifies the approximate length of a solar year on Venus?

- A** 30 days
- B** 90 days
- C** 180 days
- D** 270 days



Part 3

Directions

Use the information below to answer Numbers 26 through 28.

Africa is a continent with many natural resources and a fast-growing human population. Humans use surface resources, such as soil, water, and wildlife, for daily living. In some areas of Africa, these surface resources are scarce due to use by humans. When an area loses surface resources, the humans living in that area must move to an area that has the resources they need. Some resources found beneath the surface of Earth are still plentiful. Resources found above and below the surface of Earth must be used wisely for future generations to survive.

26 Which action is a long-term solution to the problem of fueling vehicles with gasoline?

- A** increasing gasoline production
- B** walking everywhere instead of driving
- C** improving alternative fuel technologies
- D** discovering more oil to use for gasoline

27 Which question best represents a problem that a biologist would investigate?

- A** How does air pollution in southern Africa affect migrating birds?
- B** How does surface mining in Africa affect the rate of erosion?
- C** How do winds from Africa affect sand movement in Asia?
- D** How do earthquakes affect buildings in northern Africa?

28 Dams in Africa benefit humans by controlling floods. Dams sometimes negatively affect the natural environment.

Which statement best describes a negative consequence of building a dam on a river?

- A** Large concrete structures are unsightly.
- B** Life cycles of some fish are disrupted.
- C** Small fish are trapped for fish farming.
- D** Moving water produces electricity.

Directions

Use the technical passage below to answer Numbers 29 through 31.

Seashell Evolution in Florida

Dr. Geerat Vermeij is a biologist who researches seashell fossils from Florida. These seashells were originally composed of calcium carbonate, the same compound that forms limestone. The fossilization process gradually replaces some or all of the original calcium carbonate with other minerals, while maintaining the shell's original shape. The fossil is preserved in the sedimentary record.

Florida is a particularly fruitful location for fossil hunters and researchers. During the Cretaceous Period, between 144 and 65 million years ago, a shallow ocean covered much of the state. Bedrock composed of limestone formed when shells and body parts of ocean organisms were pressed together. Shells and other fossils are common in this bedrock, offering an extensive record of the history of life in Florida.

Vermeij studies changes in seashells over a period of several million years. He describes changes as an “arms race,” a competition in which one side (seashell-forming mollusks) evolved stronger seashells in response to increasing strength on the other side (mollusk predators). The result was increased shell strength and increased predator strength. Vermeij describes it as follows:

“My arms-race idea evolved from the simple observation that Pacific shells appear more armored—more strongly knobbed, with a smaller opening—than tropical Atlantic shells. I thought about this difference, began to test the idea that differences in the power of shell-crushing predators was responsible, and then saw that modern organisms are better fortresses than ancient ones. In other words, some sort of escalation had occurred.”

29 Which processes preserve shells in sedimentary rock?

- A pressing and melting
- B melting and cooling
- C heating and uplifting
- D layering and compacting

30 Which process best explains Vermeij's reasoning on the evolution of mollusk shells?

- A sedimentation
- B climatic changes
- C competition for resources
- D predator-prey relationships



Part 3

- 31** Biologists are scientists who study living organisms. Earth scientists study the physical nature of Earth.

Explain why both types of scientists would be interested in the mollusk fossils in Florida. In your explanation, be sure to include

- a comparison of the information collected by each scientist
- the benefit of combining the information collected by each scientist



Part 3

32 Carbon dioxide and nitrogen oxides are products of car exhaust.

If the number of cars driven in a city doubles, what will most likely happen to the amount of carbon dioxide and nitrogen oxides in the air of the city?

- A** There will be less carbon dioxide and less nitrogen oxides.
- B** There will be less carbon dioxide but more nitrogen oxides.
- C** There will be more carbon dioxide but less nitrogen oxides.
- D** There will be more carbon dioxide and more nitrogen oxides.



33 Earthquake waves are recorded by seismograph machines.

What does an earthquake wave transmit?

- A** energy
- B** light
- C** particles
- D** speed



Part 4



34 Mammals must eliminate waste products that their bodies produce.

Which organ helps mammals eliminate bodily waste?

- A** appendix
- B** kidney
- C** pancreas
- D** stomach



Directions

Use the information below to answer Numbers 35 through 37.

A science teacher reviewed heat transfer with the students in a class by performing several demonstrations. The students observed that tables in sunlight felt warmer than tables in shade. The students know that sunlight is a form of energy, and energy is often transferred to other objects or transformed to some other form of energy.

Next, the teacher used a hot plate to boil water in a metal pan. The students recorded their observations and conclusions about the energy transformations and transfers in the demonstrations.

35 Convection is one method by which heat is transferred.

Heat transferred by convection causes

- A** currents
- B** tides
- C** tsunamis
- D** waves

36 Which example describes the transfer of energy from one object to another without the presence of matter?

- A** Lava heats the surface of Earth.
- B** A hot cup of tea warms a person's hand.
- C** The sun warms the atmosphere of Earth.
- D** The burner of a stove heats a pan of water.

37 Which energy transformation occurs in a plant located in the classroom?

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

38 When taken to a new habitat, non-native plants often threaten native plants of the new habitat.

Why do non-native plants threaten native plants?

- A** Non-native plants are able to mutate rapidly.
- B** Non-native plants cause native animals to relocate.
- C** Non-native plants are able to be used for medicine.
- D** Non-native plants compete with native plants for resources.



- 39** As the human population increases, more fossil fuels are being used. The burning of fossil fuels produces greenhouse gases.

How might humans reduce greenhouse gases?

- A** Buy cars that use gasoline.
- B** Build power plants that use coal.
- C** Use renewable resources to generate power.
- D** Use nonrenewable resources to generate power.



Directions

Use the information and data table below to answer Numbers 40 through 42.

A scientist prepared six mixtures in glass beakers, as indicated in the data table below. Each beaker was tightly covered, labeled, and left undisturbed for several days. After several days, the scientist observed that the gray iron filings in Mixture 4 had turned red.

MIXTURES

| Mixture | Substance Combined |
|---------|---|
| 1 | 100 grams sand and 50 grams iron filings |
| 2 | 100 grams sand and 50 grams salt |
| 3 | 100 grams sand and 50 grams water |
| 4 | 100 grams water and 50 grams iron filings |
| 5 | 100 grams water and 50 grams salt |
| 6 | 100 grams salt and 50 grams iron filings |

40 Which process would best separate the substances of Mixture 3?

- A** chromatography
- B** crystallization
- C** filtration
- D** precipitation

41 The color change in Mixture 4 indicates that

- A** a precipitate formed
- B** gases were produced
- C** the iron filings evaporated
- D** a chemical reaction occurred



- 42** After the beaker containing Mixture 4 was sealed, the iron filings changed color.

Compare the mass of the mixture in the sealed beaker to the masses of the iron filings and water before they were mixed. In your comparison, be sure to include

- the law of conservation of matter
- evidence from the data table



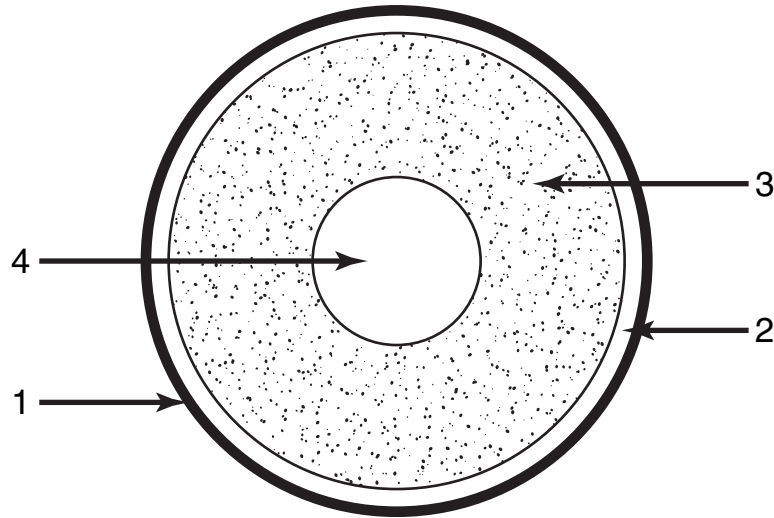
43 When trees are removed from a tropical rain forest, other plants and animals are affected.

Which statement identifies another change that will most likely occur when a rain forest habitat is destroyed?

- A** Oxygen levels will increase.
- B** Carbon dioxide levels will increase.
- C** The temperature of Earth will decrease.
- D** The air pollution in the atmosphere will decrease.



Use the diagram below to answer Number 44.



44 Which numbered arrow indicates the core of Earth?

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



Acknowledgements

“Fireflies” by Diane Swanson. © Diane Swanson, Fireflies, from *YES Magazine*, Peter Piper Publishing Inc., September/October 2002.