
XVI. Science and Technology/Engineering,
Grade 5

Grade 5 Science and Technology/Engineering Test

The spring 2008 grade 5 MCAS Science and Technology/Engineering test was based on learning standards in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). The *Framework* identifies four major content strands, listed below. Page numbers for the grades 3–5 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 26–29)
- Life Science (Biology) (*Framework*, pages 46–49)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 64–66)
- Technology/Engineering (*Framework*, page 86)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department Web site at www.doe.mass.edu/frameworks/current.html.

In *Test Item Analysis Reports* and on the Subject Area Subscore pages of the *MCAS School Reports* and *District Reports*, Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four *Curriculum Framework* content strands listed above.

Test Sessions

The MCAS grade 5 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions.

Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former limited English proficient students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item’s reporting category and the *Framework* learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

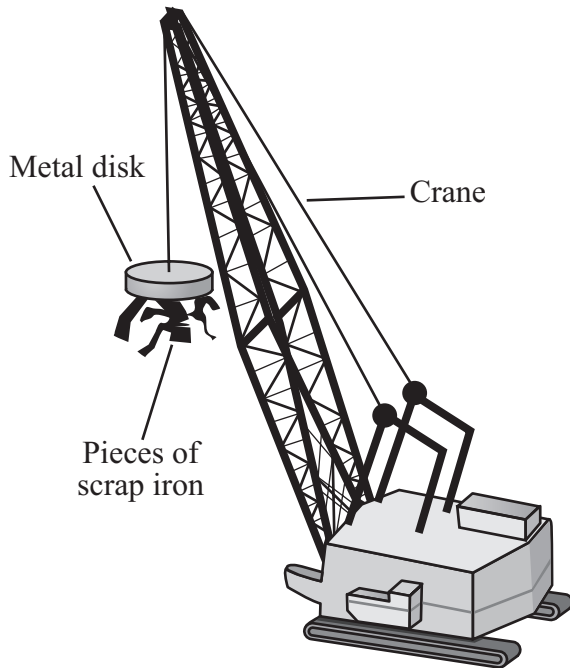
Science and Technology/Engineering

SESSION 1

DIRECTIONS

This session contains seventeen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 The diagram below shows pieces of scrap iron being picked up by a metal disk hanging from a crane.



The pieces of scrap iron are attracted to the metal disk. The metal disk is **most likely** functioning as which of the following?

- A. a battery
- B. an engine
- C. an insulator
- D. an electromagnet

- 2 Which of the following **best** represents one particular stage in a life cycle?

- A. a fish swimming
- B. a seed sprouting
- C. a leaf growing
- D. a dog eating

- 3 Which of the following is **most likely** to make a rock crack and crumble?

- A. dew evaporating on the rock
- B. leaves decaying on the rock
- C. snow melting in a crack in the rock
- D. water freezing in a crack in the rock

- 4 The picture below shows a solid floating in a liquid.



Which of the following statements describes one way that solids are different from liquids?

- A. Solids have weight and liquids do not.
- B. Solids take up space and liquids do not.
- C. Solids have a definite shape and liquids do not.
- D. Solids have a definite volume and liquids do not.

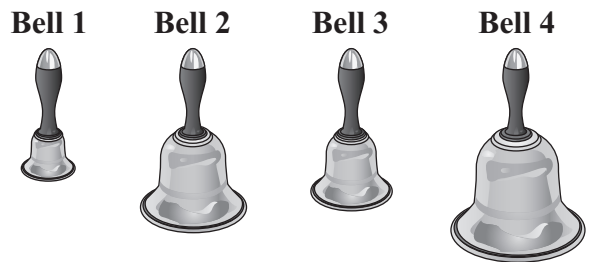
- 5 During most of the year, the air over Boston, Massachusetts, contains a high amount of moisture. Which of the following **best** explains why there is a high amount of moisture in the air?

- A. Boston is close to an ocean.
- B. Boston is at a low elevation.
- C. Boston is near many mountains.
- D. Boston is far north of the equator.

- 6 Baby chicks peck their way out of their shells when they hatch. This activity is an example of which of the following types of behavior?

- A. instinctive
- B. learned
- C. planned
- D. social

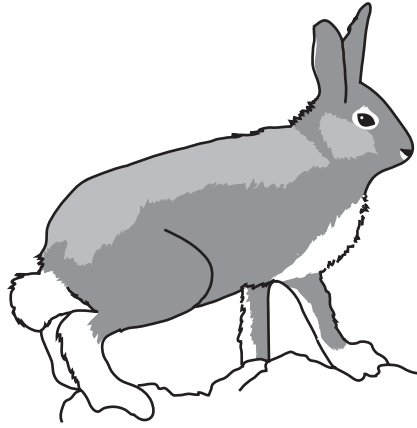
- 7 The pictures below show four different bells made of the same material.



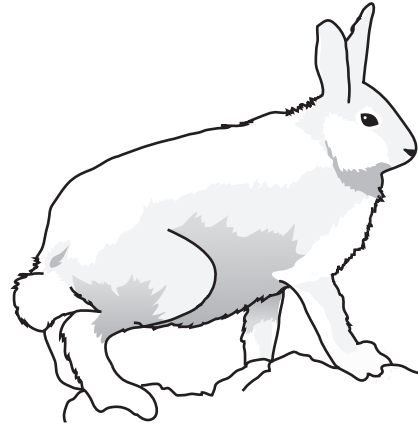
Which of the following bells should have the **lowest** pitch?

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

- 8 The pictures below show the change in the fur of an arctic hare from summer to winter.



Fur in summer

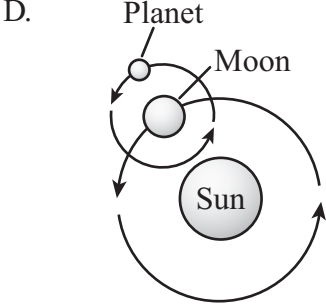
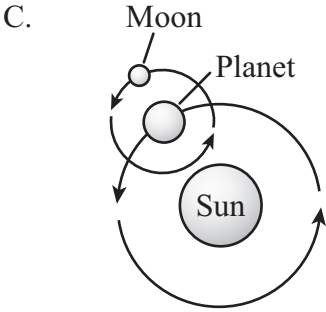
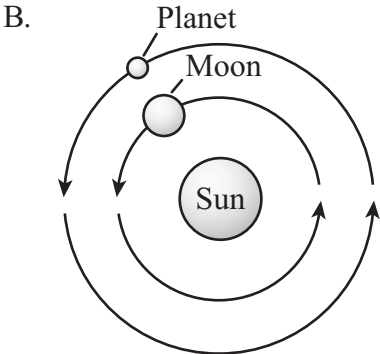
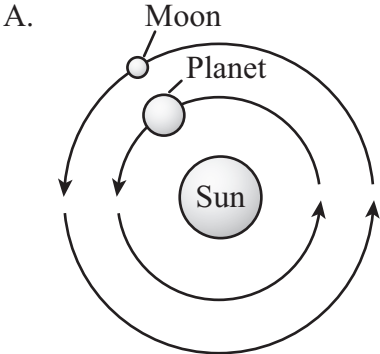


Fur in winter

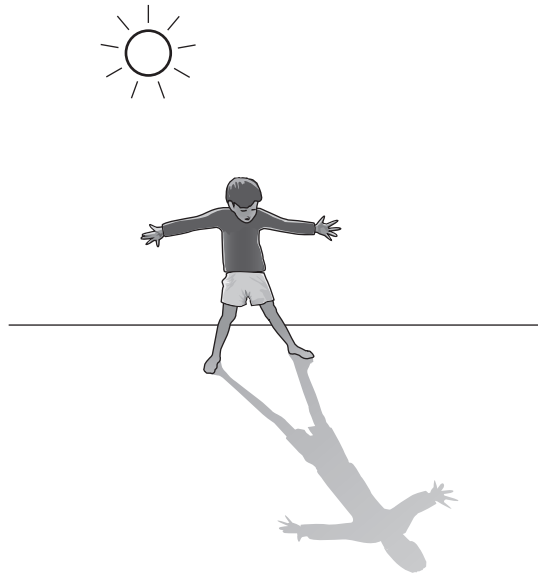
Which of the following statements **best** describes how this change helps arctic hares?

- A. It lowers their body temperature.
- B. It protects their eyes from sunlight.
- C. It helps them move on slippery ice.
- D. It makes them less visible to predators.

9 Which of the following drawings **best** represents the motion of a planet and its moon around the Sun?



- 10 The picture below shows Brandon and the shadow he creates while standing on the playground one day.



Which of the following **best** explains why Brandon creates a shadow?

- A. Brandon changes the color of sunlight hitting the ground.
- B. Brandon reflects sunlight onto the ground.
- C. Brandon bends light waves from the Sun.
- D. Brandon blocks light from the Sun.

11 Which of the following structures does a frog develop as it changes from a tadpole to an adult frog?

- A. eyes
- B. heart
- C. lungs
- D. tail

12 The marsh willow herb is a plant native to the northeastern United States. It grows best in damp habitats.

Which of the following environmental changes would **most likely** cause a decrease in the marsh willow herb population in an area?

- A. a rainstorm lasting several weeks
- B. a drought lasting twelve months
- C. unusually low temperatures during the month of July
- D. unusually high temperatures during the month of January

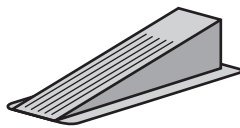
13 Which of the following objects does **not** have a wedge?

A.



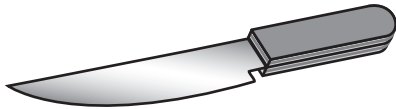
axe

B.



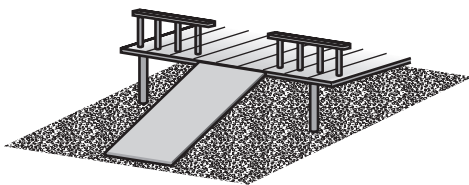
doorstop

C.



knife

D.



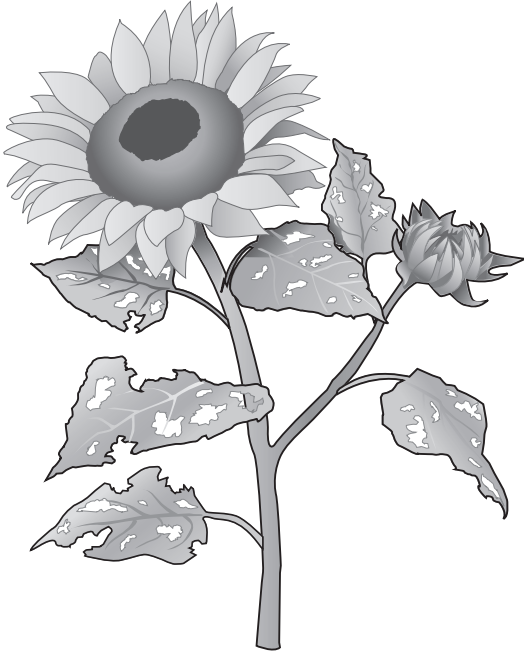
ramp

14 Michael has a pencil case made of pine wood. The surface of the pencil case scratches and dents easily. He wants to make a new pencil case that will not scratch or dent easily.

Which of the following should Michael do to make a new pencil case that will **not** scratch or dent easily?

- A. make the pencil case a different size
- B. use a different material to make the pencil case
- C. make the pencil case from another piece of pine wood
- D. use a thicker piece of pine wood to make the pencil case

- 15 Rayna is collecting seeds from a sunflower. She notices that most of the leaves on the sunflower plant have patterns of holes made by chewing insects, as shown in the picture below.



Next year, she will plant the sunflower seeds that she has collected. How many of the sunflower plants that grow are expected to inherit the chewed leaf pattern?

- A. all of the plants
- B. most of the plants
- C. half of the plants
- D. none of the plants

- 16 Which of the following events involves a consumer and producer in a food chain?
- A. A cat eats a mouse.
 - B. A deer eats a leaf.
 - C. A hawk eats a mouse.
 - D. A snake eats a rat.

- 17 Some birds, such as the vulture shown below, can soar in the air for a long time without having to flap their wings.

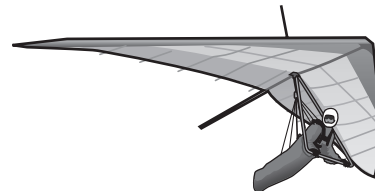


Which of the following objects can soar in the air in a way that is **most** similar to that of the vulture?

A.



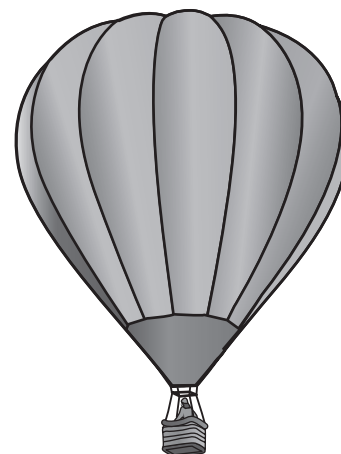
C.



B.



D.

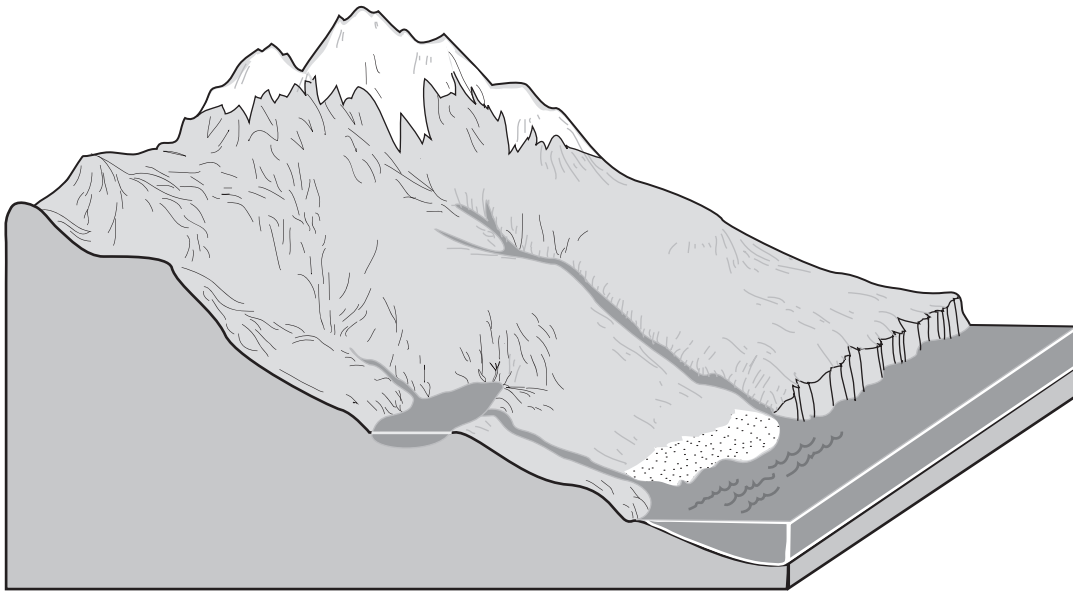


Questions 18 and 19 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

- 18** Marco is studying how natural processes cause water on Earth to move in different forms in different locations. The picture below shows an area with a snow-covered mountain near an ocean.



- a. Describe how natural processes can cause snow on the top of the mountain to someday end up as water in the ocean.
- b. Describe how natural processes can cause some of the water in the ocean to someday fall as rain or snow on the mountain.

Write your answer to question 19 in the space provided in your Student Answer Booklet.

- 19 Elena found a piece of a mineral while on a hike. She wants to identify the mineral she found.
- Identify **two** physical properties of minerals.
 - Describe how Elena can test the mineral she found for **each** of the physical properties that you identified in part (a).

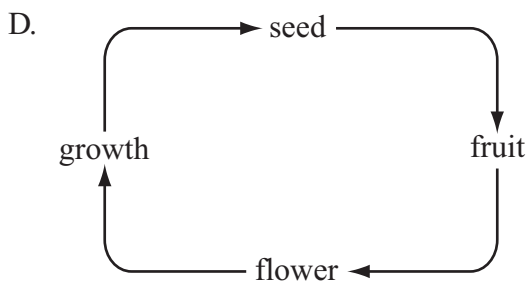
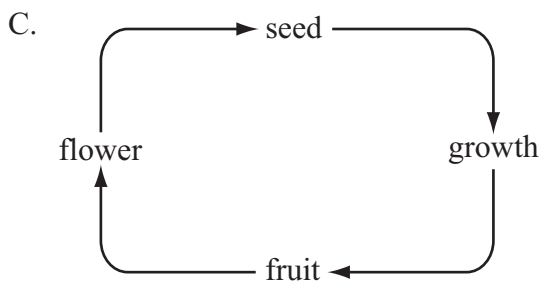
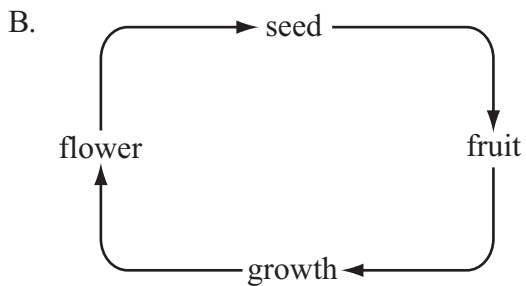
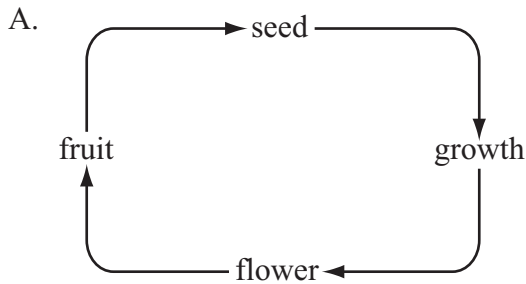
Science and Technology/Engineering

SESSION 2

DIRECTIONS

This session contains seventeen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 20 Which of the following drawings **best** shows the life cycle of berry bushes growing naturally in a forest?



- 21 Which of the following **best** describes how plants use the energy they receive from sunlight?

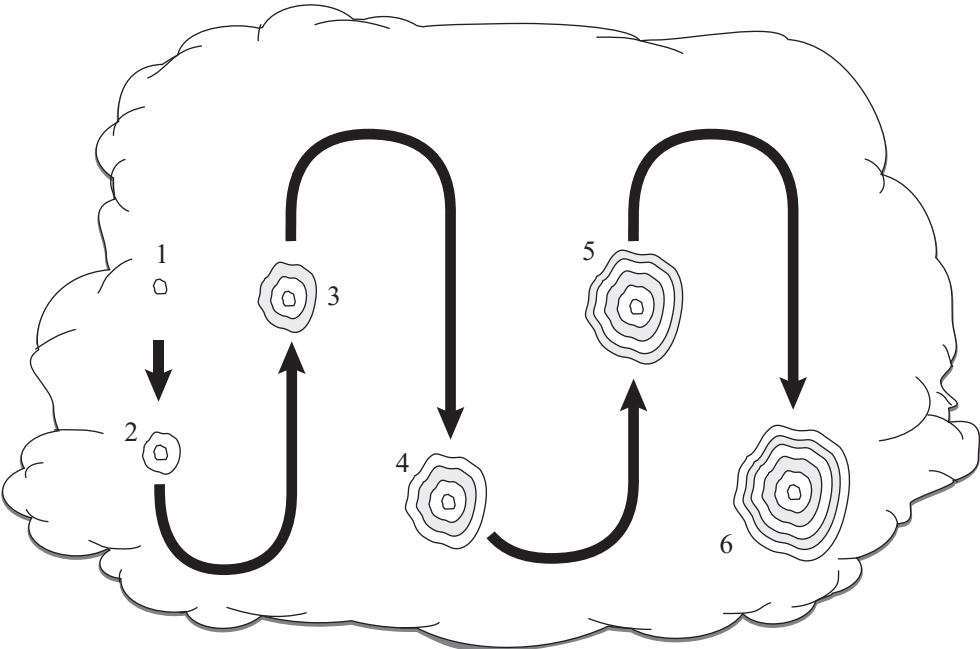
- A. They change water into heat.
- B. They produce their own food.
- C. They make minerals for their roots.
- D. They break down nutrients into rocks.

- 22 Students want to plant a lemon tree at their school, but the cold winter temperatures in Massachusetts would kill the tree. Which of the following is the **best** solution to this problem?

- A. planting several lemon trees together in a row
- B. building a greenhouse to shelter the lemon tree
- C. giving the lemon tree extra fertilizer in the winter
- D. tying a stake to the lemon tree for support during the winter

- 23 Which of the following **best** explains why many species of birds in New England fly south for the winter months?
- A. to find a place to hibernate
 - B. to move away from strong sunlight
 - C. to find an environment with more food
 - D. to move away from crowded environments
- 24 Many bacteria are decomposer organisms. Which of the following statements **best** describes how these bacteria help make soil more fertile?
- A. The bacteria break down water into food.
 - B. The bacteria change sunlight into minerals.
 - C. The bacteria combine with sand to form rocks.
 - D. The bacteria break down plant and animal matter.

25 The diagram below represents the formation of one type of precipitation in a cloud.



Which type of precipitation is formed as shown?

- A. hail
- B. rain
- C. sleet
- D. snow

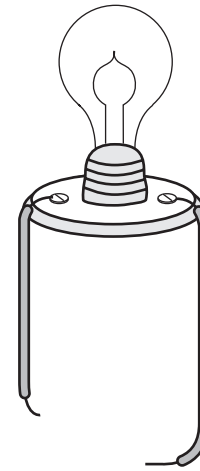
26 A statue and a table are both made of the same type of marble. Which of the following properties will **most likely** be the same for both of these objects?

- A. size
- B. shape
- C. weight
- D. hardness

27 Which of the following statements **best** explains why stars appear to move across Earth’s sky each night?

- A. Earth rotates on its axis.
- B. The stars orbit each other.
- C. Earth revolves around the Sun.
- D. The stars rotate with the Moon.

28 The picture below shows an incomplete electrical circuit.



Which of the following objects can be connected to the ends of the two wires to make the circuit complete and light the bulb?

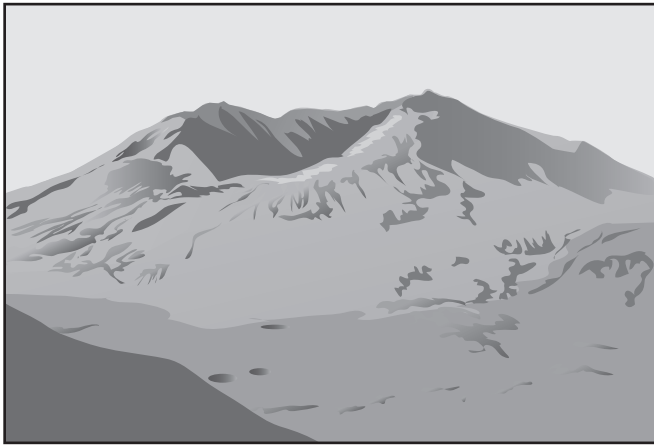
- A. a battery
- B. a switch
- C. another bulb
- D. another wire

- 29 The pictures below show the same area before and after an event occurred.

Before Event



After Event



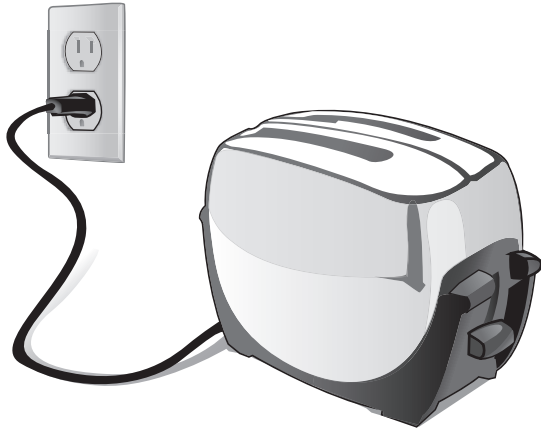
Which of the following events **most likely** caused the change in this area?

- A. a flood
- B. a hurricane
- C. a volcanic eruption
- D. a strong earthquake

- 30 A student observed the shape of the Moon once every 7 days during the month of June. Which of the following sets of drawings shows how the Moon's shape could have changed during the month of June?

- A. June 1 June 8 June 15 June 22 June 29
- B. June 1 June 8 June 15 June 22 June 29
- C. June 1 June 8 June 15 June 22 June 29
- D. June 1 June 8 June 15 June 22 June 29

- 31 A piece of bread is stuck in the toaster pictured below.



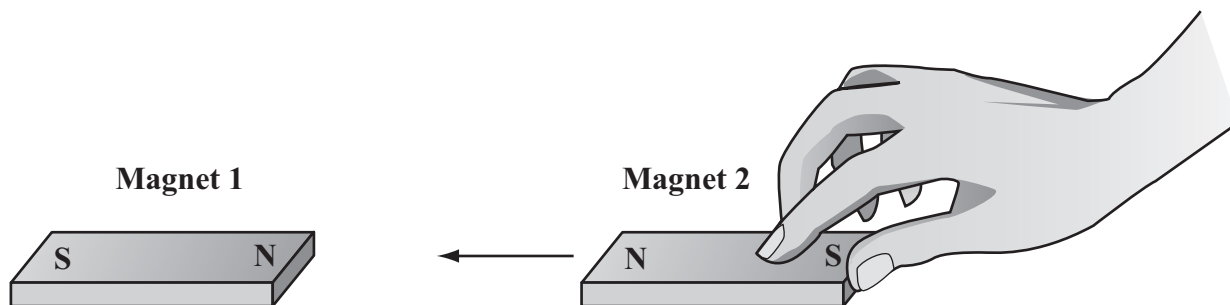
Which of the following explains why it is unsafe to use a metal fork to remove the piece of bread from the toaster?

- A. The fork will catch on fire.
- B. The fork will melt in the toaster.
- C. The fork will conduct electricity.
- D. The fork will damage the toaster.

- 32 Which type of rock is formed when hot lava cools?

- A. coal
- B. igneous
- C. limestone
- D. metamorphic

- 33 The picture below shows magnet 2 being pushed toward magnet 1.



Which of the following will **most likely** happen to magnet 1 as magnet 2 is moved closer?

- A. Magnet 1 will move under magnet 2.
- B. Magnet 1 will move toward magnet 2.
- C. Magnet 1 will move on top of magnet 2.
- D. Magnet 1 will move away from magnet 2.

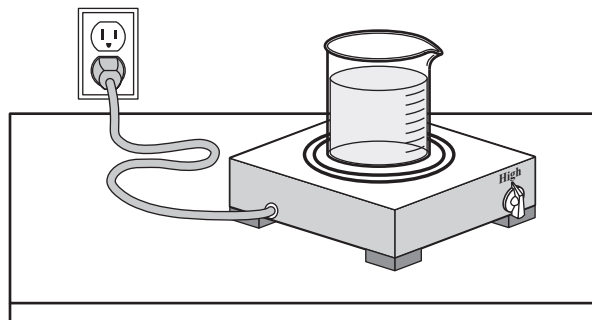
- 34 The chart below lists the organisms that Tamara sorted into two groups based on one physical characteristic.

Group 1	Group 2
alligator	bat
goldfish	deer
snake	mouse
tuna	rabbit

Which of the following physical characteristics did Tamara **most likely** use to sort the organisms into the two groups?

- A. number of legs
- B. size of the body
- C. shape of the feet
- D. type of body covering

- 35 The picture below shows a beaker being heated on a hot plate.



Which type of energy transfer occurs when a beaker of water is heated on a hot plate?

- A. light to heat
- B. chemical to heat
- C. electrical to heat
- D. magnetic to heat

- 36 Annette is using many tools to build a doghouse. For which of the following would Annette **most likely** use a tape measure while building the doghouse?

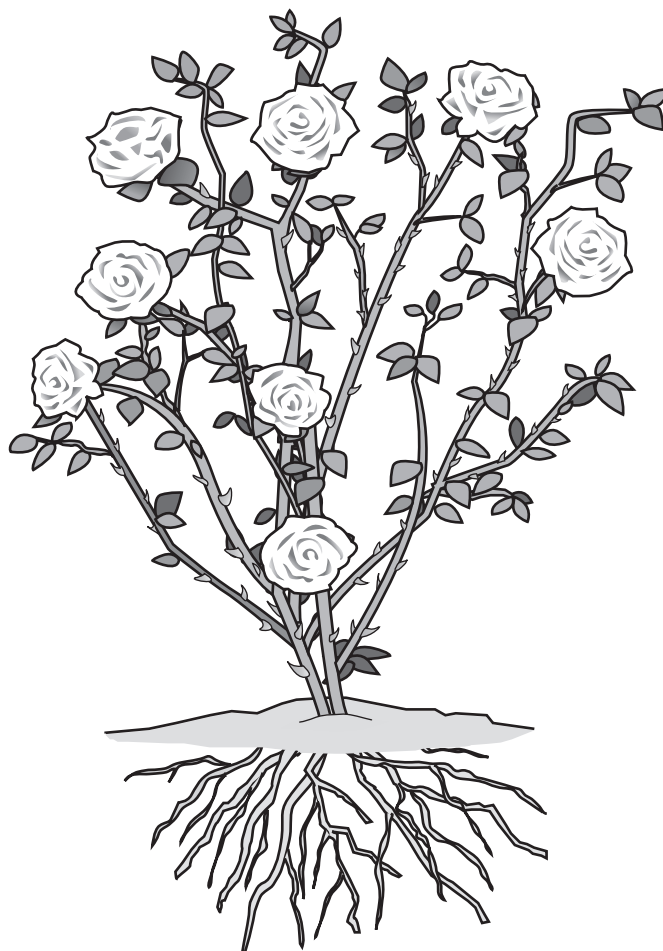
- A. deciding which type of wood to use
- B. removing extra nails from the wood
- C. attaching different pieces of wood together
- D. determining where to cut the wood into pieces

Questions 37 through 39 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 37 in the space provided in your Student Answer Booklet.

- 37** The picture below shows a rosebush. Different structures of the rosebush have functions that help the plant to survive, grow, and reproduce.



- Identify **three** different plant structures of the rosebush.
- Describe a function of **each** of the plant structures you named in part (a).

Write your answer to question 38 in the space provided in your Student Answer Booklet.

- 38 During a technology class, Eric was asked to design and make his own paper airplane from a single sheet of paper. After making his paper airplane, Eric was asked to record how he made it so that another student could make the same type of airplane following the same design.
- Describe **two** different methods that Eric could use to record how he made his paper airplane so that another student could make the same type of airplane.
 - Explain how **each** method you described in part (a) will help another student make the same type of airplane following the same design.

Write your answer to question 39 in the space provided in your Student Answer Booklet.

- 39 Water is commonly found on Earth in three states of matter: solid, liquid, and gas. In everyday life, water often changes from one form to another form.
- Describe **one** example of water changing from a liquid to a solid.
 - For the example you gave in part (a), explain what caused this change.
 - Describe **one** example of water changing from a liquid to a gas.
 - For the example you gave in part (c), explain what caused this change.

**Grade 5 Science and Technology/Engineering
Spring 2008 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	411	<i>Physical Sciences (Chemistry and Physics)</i>	8	D
2	411	<i>Life Science (Biology)</i>	3	B
3	411	<i>Earth and Space Science</i>	4	D
4	412	<i>Physical Sciences (Chemistry and Physics)</i>	2	C
5	412	<i>Earth and Space Science</i>	11	A
6	412	<i>Life Science (Biology)</i>	8	A
7	412	<i>Physical Sciences (Chemistry and Physics)</i>	11	D
8	413	<i>Life Science (Biology)</i>	9	D
9	414	<i>Earth and Space Science</i>	13	C
10	415	<i>Physical Sciences (Chemistry and Physics)</i>	12	D
11	416	<i>Life Science (Biology)</i>	4	C
12	416	<i>Life Science (Biology)</i>	7	B
13	417	<i>Technology/Engineering</i>	1.3	D
14	417	<i>Physical Sciences (Chemistry and Physics)</i>	1	B
15	418	<i>Life Science (Biology)</i>	5	D
16	418	<i>Life Science (Biology)</i>	11	B
17	419	<i>Technology/Engineering</i>	2.4	C
18	420	<i>Earth and Space Science</i>	10	
19	421	<i>Earth and Space Science</i>	2	
20	422	<i>Life Science (Biology)</i>	3	A
21	422	<i>Life Science (Biology)</i>	11	B
22	422	<i>Technology/Engineering</i>	2.1	B
23	423	<i>Life Science (Biology)</i>	9	C
24	423	<i>Earth and Space Science</i>	4	D
25	424	<i>Earth and Space Science</i>	7	A
26	425	<i>Physical Sciences (Chemistry and Physics)</i>	1	D
27	425	<i>Earth and Space Science</i>	14	A
28	425	<i>Physical Sciences (Chemistry and Physics)</i>	6	A
29	426	<i>Earth and Space Science</i>	12	C
30	426	<i>Earth and Space Science</i>	15	A
31	427	<i>Physical Sciences (Chemistry and Physics)</i>	7	C
32	427	<i>Earth and Space Science</i>	3	B
33	428	<i>Physical Sciences (Chemistry and Physics)</i>	9	D
34	429	<i>Life Science (Biology)</i>	1	D
35	429	<i>Physical Sciences (Chemistry and Physics)</i>	5	C
36	429	<i>Technology/Engineering</i>	1.2	D
37	430	<i>Life Science (Biology)</i>	2	
38	431	<i>Technology/Engineering</i>	2.2	
39	432	<i>Physical Sciences (Chemistry and Physics)</i>	3	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's Web site later this year.

