XVI. Science and Technology/Engineering, Grade 5

Grade 5 Science and Technology/Engineering Test

The spring 2016 grade 5 Science and Technology/Engineering test was based on learning standards in the four major content strands in the *Massachusetts Science and Technology/Engineering Curriculum Framework* (2006) 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 Massachusetts Science and Technology/Engineering Curriculum Framework is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

Test Sessions

The grade 5 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

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

Grade 5 Science and Technology/Engineering Session 1

DIRECTIONS

This session contains eleven multiple-choice questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

The drawing below shows a student blowing across the open top of a bottle that is half full of water.



When the student blows across the bottle of water, a sound is made. Which of the following directly causes this sound?

- A. Air vibrates inside of the bottle.
- B. Warm air heats the inside of the bottle.
- C. Air moves away from the outside of the bottle.
- D. Warm air touches cold water inside of the bottle.

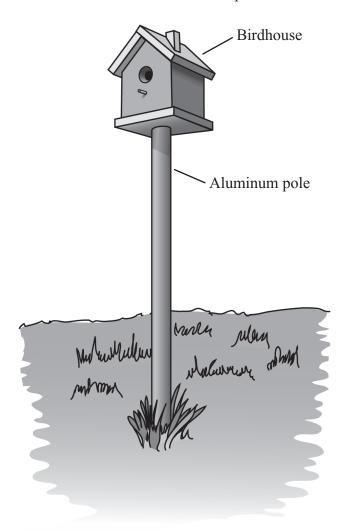
A student is collecting water samples.

The student needs a container that holds water, will not break easily, and can be used many times.

Which of the following containers will **best** meet the student's needs?

- A. a glass jar
- B. a paper cup
- C. a wooden box
- D. a plastic bottle
- Which of the following actions is **most likely** part of a test to find the hardness of a mineral sample?
 - A. heating the sample on a hot plate
 - B. scratching the sample with a nail
 - C. hitting the sample with a hammer
 - D. shining a bright light on the sample

The diagram below shows a birdhouse attached to an aluminum pole.

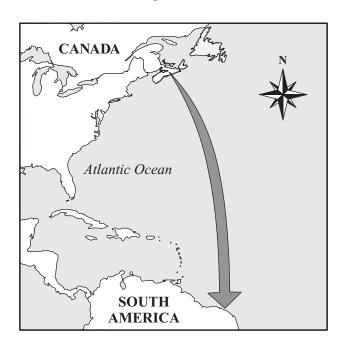


To be able to support the birdhouse, which of the following features of the pole is **most** important?

- A. its color
- B. its length
- C. its thickness
- D. its temperature



The sandpiper is a type of shore bird. In the fall, one species of sandpiper migrates from Canada to South America. The birds stay in South America through the winter. The arrow in the map below shows the migration route.



Which of the following statements best explains why the sandpiper migrates to South America?

- A. There is less rain in South America during the winter.
- B. There is more food available in South America during the winter.
- C. There are more sandpiper predators in South America during the winter.
- D. There is less sandpiper habitat available in South America during the winter.

6 The picture below shows a lemur.



© Art Wolfe/Iconica/Getty Images

Lemurs are mammals that live high up in the trees of tropical forests. Lemurs eat fruit and insects.

Which of the following adaptations most helps lemurs to live in tropical trees?

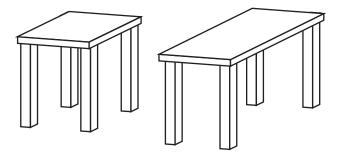
- A. Lemurs have soft, gray fur that keeps them warm in cool weather.
- B. Lemurs have strong, long tails that can be curled around branches.
- C. Lemurs have small, black eyes that allow them to see well at night.
- D. Lemurs have sharp, razor-like teeth that can be used to tear apart food.



Which of the following happens only during the adult stage of the life cycle of a frog?

- A. A frog lays eggs.
- B. A frog swims in water.
- C. A frog begins to lose its tail.
- D. A frog begins to develop lungs.

8 The picture below shows two wooden tables at a furniture store. The tables are not painted or coated.

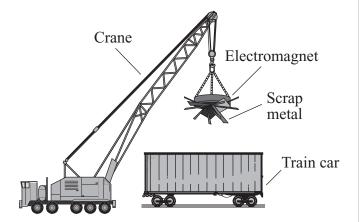


A shopper wants to find out if the tables are made from the same type of wood. Which of the following properties of the tables could be used to find this out?

- A. weight and shape
- B. weight and hardness
- C. color and shape
- D. color and hardness

- 9 In a meadow ecosystem, mice receive most of the energy they need to survive directly from which of the following sources?
 - A. minerals
 - B. oxygen
 - C. plants
 - D. water

A crane operator uses a crane with an electromagnet to move scrap metal over a train car, as shown below.



Which of the following statements describes what the crane operator does to drop the scrap metal into the train car?

- A. The crane operator turns on a magnetic charge in the scrap metal.
- B. The crane operator turns off an electric current in the electromagnet.
- C. The crane operator sends out a signal that causes the train car to become an electromagnet.
- D. The crane operator sends out a signal that blocks the magnetic properties of the scrap metal.



A student is watching a local television weather report for Gloucester,
Massachusetts. Which of the following is **most likely** included in this weather report?

- A. the speed of currents in a river
- B. the amount of moisture in the air
- C. the depth of currents in the ocean
- D. the level of moisture in the ground

Grade 5 Science and Technology/Engineering Session 2

DIRECTIONS

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



The stages in the life cycle of an organism are shown below.

birth \rightarrow growth \rightarrow development \rightarrow reproduction \rightarrow death

In which life cycle stage will a new organism be made?

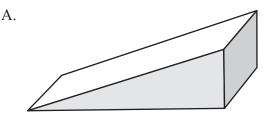
- A. growth
- B. development
- C. reproduction
- D. death

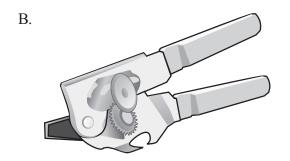


Which of the following describes an instinctive behavior?

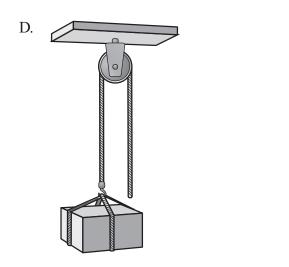
- A. a behavior that occurs only in adult fish
- B. a behavior that occurs only in small mammals
- C. a behavior that an animal learns how to do over time
- D. a behavior that an animal is born knowing how to do

Which of the following pictures shows a complex machine?



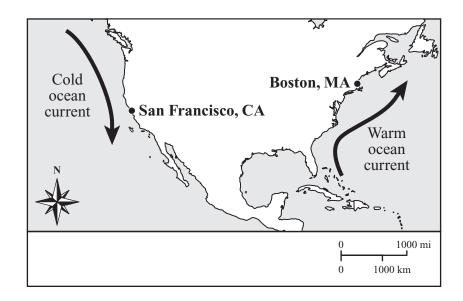






- Which of the following characteristics of an individual wolf is **most** affected by its environment?
 - A. the size of its feet
 - B. the color of its eyes
 - C. the shape of its ears
 - D. the condition of its fur
- Water moves directly from a lake to the air by which of the following processes?
 - A. condensation
 - B. evaporation
 - C. precipitation
 - D. sedimentation

The map below shows the locations of San Francisco, California, and Boston, Massachusetts, and the direction of the ocean current off each coast.



Based on the map, how do ocean currents **most likely** affect the climates of San Francisco and Boston?

- A. More precipitation falls in San Francisco than in Boston.
- B. Average wind speeds are greater in San Francisco than in Boston.
- C. Average summer temperatures are lower in San Francisco than in Boston.
- D. Storms move from east to west in San Francisco and from west to east in Boston.

The picture below shows a candle in a candleholder.



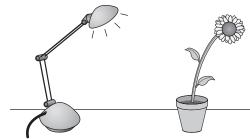
Which of the following problems was this candleholder **most likely** designed to solve?

- A. The candle's light is too dim.
- B. The candle falls over when lit.
- C. The candle blows out in the wind.
- D. The candle's wax melts too quickly.

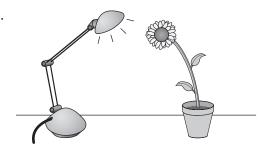
19

A student is growing a flowering plant next to a lamp in a dark room. Which of the following pictures shows how the plant **most likely** grows in response to the light from the lamp?

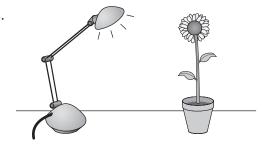
A.



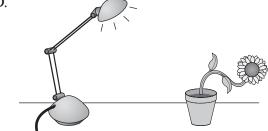
В.



C.



D.



Questions 20 and 21 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 20 in the space provided in your Student Answer Booklet.



The shape of Earth's surface is continually being changed over time. The picture below shows some mountains that are being changed by slow and rapid processes.



Scenes from Yellowstone, Andrew, M ©2005

- a. Identify **one** natural process that can slowly change the shape of these mountains over many thousands of years.
- b. Describe how the process you identified in part (a) can slowly change the shape of these mountains.
- c. Identify **one** natural process that can rapidly change the shape of these mountains in a short period of time, such as days or weeks.
- d. Describe how the process you identified in part (c) can rapidly change the shape of these mountains.

Write your answer to question 21 in the space provided in your Student Answer Booklet.



The drawing below shows two strong bar magnets. The north pole of one of the magnets has been identified. The other poles are labeled 1, 2, and 3.



- a. Based on the position of the magnets, identify each of the poles (labeled 1, 2, and 3) as either north or south.
- b. Explain how you were able to identify each of the poles in part (a).
- c. Describe what would happen if the second magnet was flipped so that the poles labeled 1 and 3 were next to each other.

Grade 5 Science and Technology/Engineering Spring 2016 Released Items: Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	265	Physical Sciences	11	A
2	265	Technology/Engineering	1.1	D
3	265	Earth and Space Science	2	В
4	266	Technology/Engineering	2.3	С
5	266	Life Science	7	В
6	267	Life Science	6	В
7	267	Life Science	4	A
8	268	Physical Sciences	1	D
9	268	Life Science	11	С
10	269	Physical Sciences	8	В
11	269	Earth and Space Science	6	В
12	270	Life Science	3	С
13	270	Life Science	8	D
14	271	Technology/Engineering	1.3	В
15	271	Life Science	5	D
16	271	Earth and Space Science	10	В
17	272	Earth and Space Science	8	С
18	273	Technology/Engineering	2.1	С
19	273	Life Science	9	В
20	274	Earth and Space Science	12	
21	275	Physical Sciences	9	

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

Grade 5 Science and Technology/Engineering Spring 2016 Unreleased Common Items: Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	Earth and Space Science	7
23	Life Science	10
24	Earth and Space Science	1
25	Earth and Space Science	4
26	Physical Sciences	12
27	Physical Sciences	7
28	Technology/Engineering	2.2
29	Life Science	1
30	Physical Sciences	4
31	Physical Sciences	10
32	Earth and Space Science	13
33	Life Science	7
34	Earth and Space Science	15
35	Physical Sciences	2
36	Physical Sciences	6
37	Life Science	11
38	Life Science	2
39	Physical Sciences	5
40	Earth and Space Science	11
41	Earth and Space Science	14
42	Earth and Space Science	9