
X. Science and Technology/Engineering, Grade 5 □

Grade 5 Science and Technology/Engineering Test

The spring 2005 Grade 5 MCAS Science and Technology/Engineering Test was based on learning standards in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2001). The *Framework* identifies four major content strands, listed below. Page numbers for the grade 3–5 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 22–26)
- Life Science (Biology) (*Framework*, pages 41–44)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 57–59)
- Technology/Engineering (*Framework*, pages 75–76)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department Web site at www.doe.mass.edu/frameworks/scitech/2001/0501.pdf.

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 and Content Overview

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 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.

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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 picture below shows a group of toys on the floor.



Which property of this set appears to be the same?

- A. length
- B. pattern
- C. shape
- D. volume

- 2 The table below shows the average monthly temperatures for Massachusetts over a 30-year period.

Month	Temperature
January	-1°C
February	0°C
March	3°C
April	?
May	15°C
June	20°C
July	23°C
August	22°C
September	18°C
October	13°C
November	7°C
December	1°C

The average temperature for April is missing. Which is the **best** estimate of the average temperature for April?

- A. 1°C
- B. 10°C
- C. 16°C
- D. 20°C

- 3 Which of the following activities is the **best** example of instinctive behavior in an animal?
- A. A dog sits when told to sit by its owner.
 - B. A bird avoids an insect that has a bad taste.
 - C. A newly hatched sea turtle walks toward the ocean.
 - D. A chimpanzee uses a stick to pull termites from a tree stump.

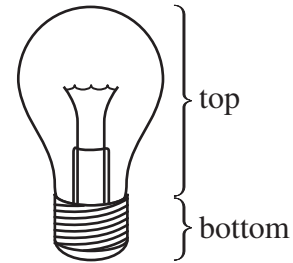
- 4 The picture below shows a duck swimming in a lake.



A student sees a mirror image of a duck in the water of the lake. What causes this mirror image?

- A. black light
- B. refracted light
- C. reflected light
- D. absorbed light

- 5 The picture below shows a light bulb.



The bottom of this light bulb is an example of what type of simple machine?

- A. a lever
- B. a pulley
- C. a screw
- D. a wedge

- 6 David planted ten corn seeds in sandy soil and ten corn seeds in clay soil. He kept both groups of plants at room temperature, gave them the same amount of water, and placed them all in the same sunny room.

Which of the following questions is David most able to answer with his experiment?

- A. How much soil and water do corn seeds need to grow?
- B. Do corn plants grow better in sandy soil or in clay soil?
- C. Do corn plants grown in sandy soil need more water than corn plants grown in clay soil?
- D. What are the effects of soil, temperature, water, and sunshine on the growth of corn plants?

- 7 Which of the following animals goes through metamorphosis?
- A. alligator
 - B. frog
 - C. lizard
 - D. turtle
- 8 Which of the following objects is probably the **most** flexible?
- A. a ceramic dish
 - B. a wooden block
 - C. a short steel rod
 - D. a new rubber hose
- 9 Alicia has lots of old bicycle parts. She wants to build something new with the parts. What is the first thing Alicia should do?
- A. plan the new item
 - B. construct the new item
 - C. try out the new item
 - D. evaluate the new item
- 10 When trees develop leaves in the spring, changes occur on the forest floor. Why does the development of leaves cause changes on the forest floor?
- A. Rainfall increases.
 - B. Sunlight is reduced.
 - C. Wind speed increases.
 - D. Animal migration is stopped.

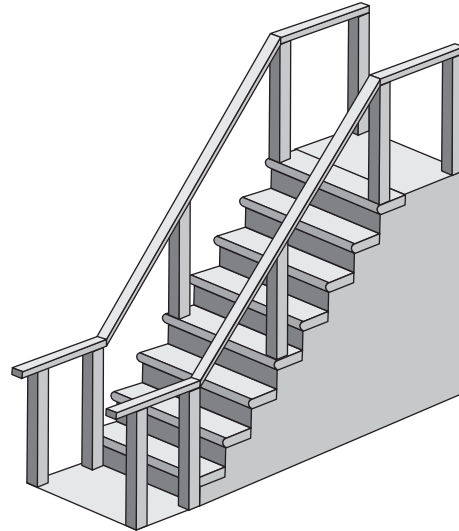
- 11 A student created the table of materials shown below.

Natural Materials	Human-made Materials
wood	plastic
cotton	polyester
clay	silk

Which of the materials in the table is listed incorrectly?

- A. silk
 - B. clay
 - C. plastic
 - D. wood
- 12 The purpose of thorns on a plant is **most likely** to
- A. help the plant to get moisture.
 - B. anchor the plant in the ground.
 - C. protect the plant from harm.
 - D. support the stems and branches.

- 13 The picture below shows a staircase.



A staircase is **most** like what type of simple machine?

- A. lever
 - B. wedge
 - C. inclined plane
 - D. wheel and axle
- 14 Which of the following properties **best** describes a material's ability to resist scratching?
- A. weight
 - B. flexibility
 - C. length
 - D. hardness

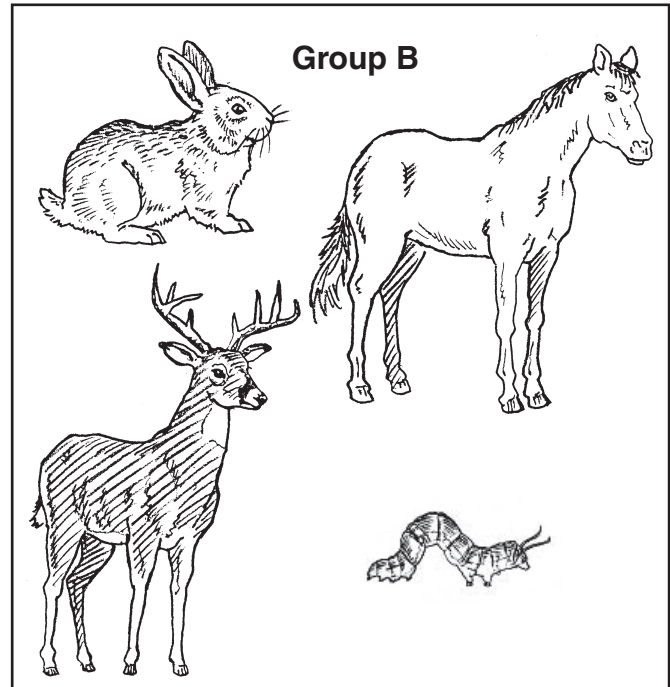
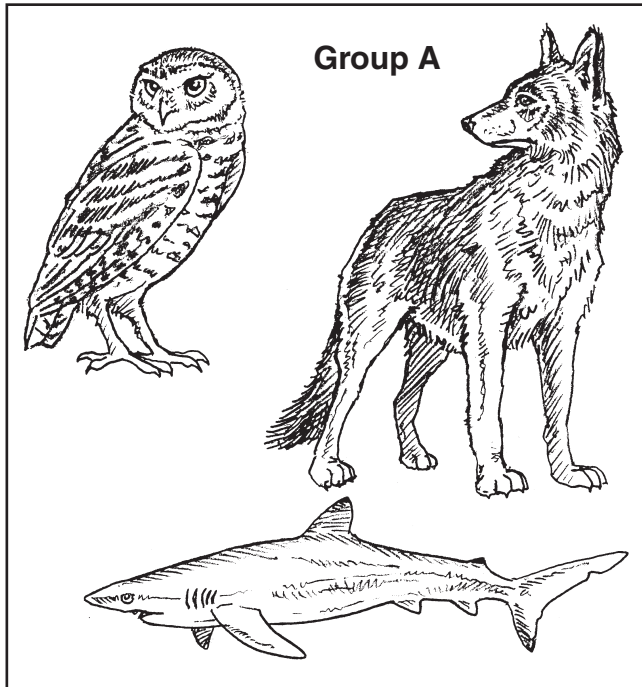
15 When a volcano erupts, lava flows out from the top. What type of rock is formed as the lava cools?

- A. magma
- B. igneous
- C. sedimentary
- D. metamorphic

16 In a city, the daily high and low temperatures for a month are **best** represented by which of the following?

- A. flow chart
- B. line graph
- C. pictograph
- D. pie chart

17 The pictures below show animals separated into two different groups.



The animals above are grouped by eating habits. Which of the following animals belongs in Group A?

- A. squirrel
- B. sheep
- C. hawk
- D. goat

DIRECTIONS

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 Starting from an egg, a butterfly goes through four stages in its life cycle.

- In your Student Answer Booklet, draw the life cycle of a butterfly, showing the four stages in order.

- Label **each** of the four stages.

- Draw arrows to connect the stages in the correct order.

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

19 A cook notices a teakettle full of water on a stove. There is a cold window close to the spout of the kettle. The water begins to boil and water droplets begin to form on the window.

- Describe in detail what is happening to the water inside the kettle.

- Why do the water droplets form on the window? Be sure to explain in detail.

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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 Kendra has a mineral that she wants to identify. It is white in color, has a glassy luster, and has a hardness of 5. The table below shows some properties of selected minerals.

Mineral	Color(s)	Luster	Hardness
Calcite	White	Dull or Pearly	3
Fluorite	White, Blue, Green, Violet	Glassy	4
Apatite	White, Green, Brown, Violet	Glassy or Greasy	5
Topaz	Yellow, Red, White, Blue	Glassy	8

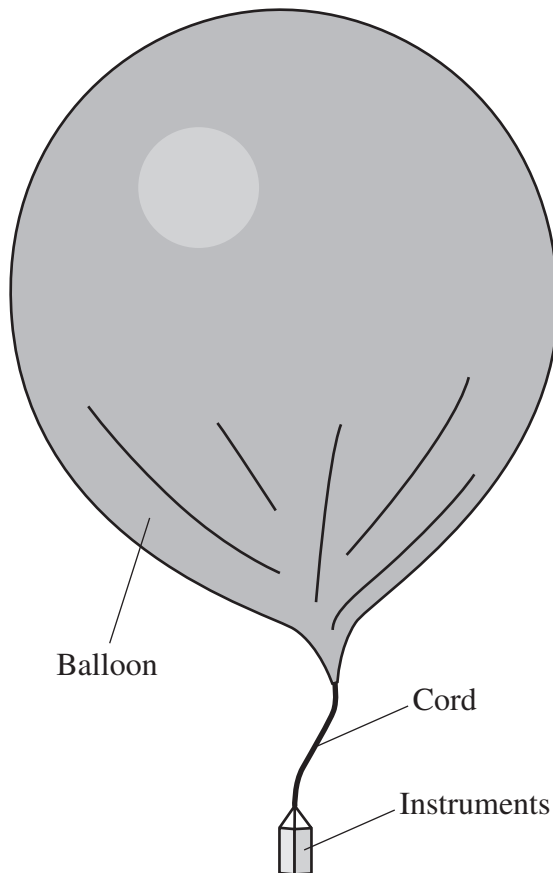
Based on the information in the table, Kendra's mineral is **most** similar to

- A. calcite.
- B. fluorite.
- C. apatite.
- D. topaz.

- 21 Female seals usually return to the same beaches year after year to give birth. If they are repeatedly disturbed by humans at those beaches, how will the seals **most likely** respond?
- A. They will change color.
 - B. They will give birth to more pups.
 - C. They will hunt for food more often.
 - D. They will give birth at different beaches.

- 22 What happens to the path of a light ray as it passes from air into water at an angle?
- A. Its path widens.
 - B. Its path bends.
 - C. Its path becomes shorter.
 - D. Its path continues in a straight line.

- 23 The weather balloon shown below is made to carry instruments for collecting data about the atmosphere.



What property of the instruments must be considered in order for the balloon to rise?

- A. height
- B. shape
- C. strength
- D. weight

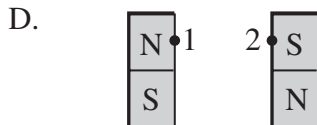
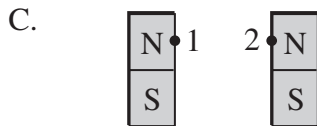
- 24 Tomato plants grow in warm weather. If the temperature drops below 32°F for two days in a row, what will **most likely** happen to the tomato plants?

- A. They will die.
- B. They will migrate.
- C. They will hibernate.
- D. They will grow faster.

- 25 When the temperature of a sample of water is -5°C , the water is

- A. a gas.
- B. a liquid.
- C. a solid.
- D. a vapor.

26 In which case would it take the **most** effort to make points 1 and 2 on the magnets touch each other?



27 Clouds and fog are made up of

- A. water.
- B. heat.
- C. light.
- D. helium.

28 Which habitat on Earth would **probably** add the greatest amount of water to the water cycle through evaporation?

- A. cold lake
- B. desert sand
- C. warm ocean
- D. mountain rock

29 Which of the following was probably **most** important in the formation of dark, fertile soil that is good for farming?

- A. plant decomposition
- B. radioactive decay
- C. water erosion
- D. wind erosion

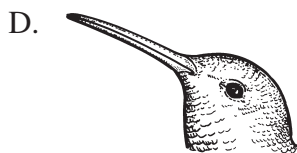
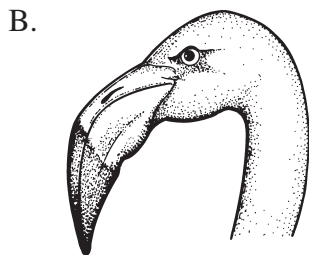
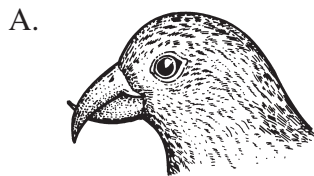
30 When a light bulb is turned on, energy changes from one form to another. Which of the following **best** describes this change?

- A. sound energy to light energy
- B. nuclear energy to light energy
- C. electrical energy to light energy
- D. magnetic energy to light energy

- 31 The picture below shows a flower with a long slender bloom.

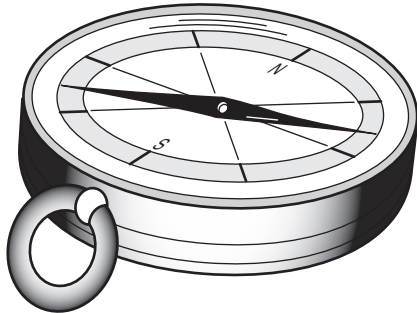


The size and shape of a bird's beak are related to the type of food that the bird eats. Which of the following beaks is suitable for drinking nectar located deep within flowers such as the one shown above?



- 32 Which of the following climates has cold winters and hot summers?
- A. polar
 - B. subtropical
 - C. temperate
 - D. tropical
- 33 Sound reaches our ears because sound makes air particles
- A. heat up.
 - B. cool down.
 - C. slow down.
 - D. vibrate.
- 34 A small laundry room has several shelves above the washing machine. These shelves are an example of
- A. making the wall stronger.
 - B. using storage space efficiently.
 - C. using a machine for more than one purpose.
 - D. solving the need for shelter in a creative way.

- 35 The picture below shows a compass.



Which type of energy causes the needle on this compass to move?

- A. heat
- B. light
- C. magnetic
- D. sound

- 36 Which weather instrument measures air pressure?

- A. thermometer
- B. anemometer
- C. rain gauge
- D. barometer

DIRECTIONS

Questions 37 through 39 are open-response questions.

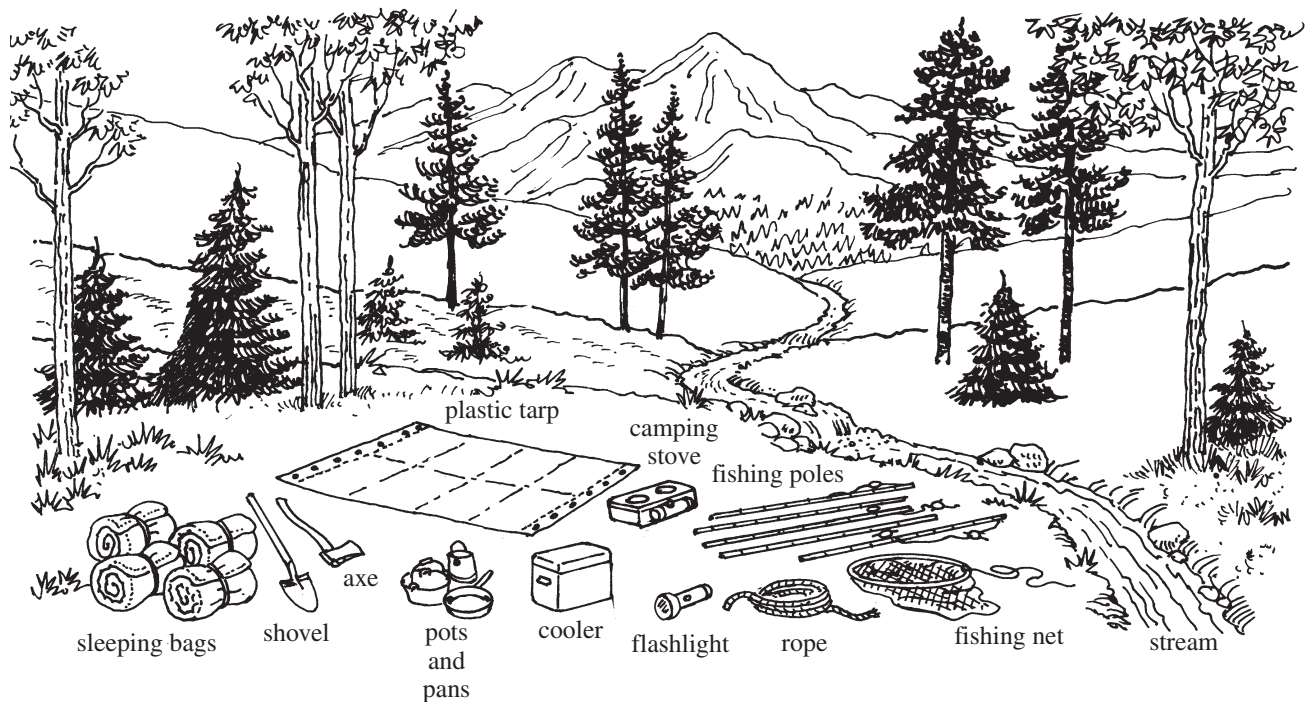
- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

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

- 37 How is soil formed? In your answer, include **two** of the major components of soil.

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

- 38 The picture below shows some camping supplies. These supplies were brought on a camping trip by a group of students.



The students forgot their tent. The weather forecast predicted rain for that evening.

- From the supplies pictured, list materials that the students can use to construct a shelter to keep dry.
- Describe how the students would use these materials to create the shelter.
- The students' shelter needs to be safe. Should the students build their shelter in the clearing near the stream or in the wooded area? Explain the reasons for your choice based on safety factors.

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

- 39 Penguins are birds that have webbed feet and very small wings. They are unable to fly, but can use their wings as paddles. They also have thick, oily feathers and a thick layer of fat. Most penguins are black and white in color.

a. List **two** features of penguins that help them survive.

b. Explain how these features help penguins survive in their natural environment.

Grade 5 Science and Technology/Engineering
Spring 2005 Released Items:
Reporting Categories, Standards, and Correct Answers

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	232	<i>Physical Science (Chemistry and Physics)</i>	1	C
2	232	<i>Earth and Space Science</i>	6	B
3	233	<i>Life Science (Biology)</i>	8	C
4	233	<i>Physical Science (Chemistry and Physics)</i>	12	C
5	233	<i>Technology/Engineering</i>	1.3	C
6	233	<i>Earth and Space Science</i>	5	B
7	234	<i>Life Science (Biology)</i>	4	B
8	234	<i>Physical Science (Chemistry and Physics)</i>	1	D
9	234	<i>Technology/Engineering</i>	2.3	A
10	234	<i>Life Science (Biology)</i>	10	B
11	235	<i>Technology/Engineering</i>	2.4	A
12	235	<i>Life Science (Biology)</i>	2	C
13	235	<i>Technology/Engineering</i>	1.3	C
14	235	<i>Technology/Engineering</i>	1.1	D
15	236	<i>Earth and Space Science</i>	3	B
16	236	<i>Technology/Engineering</i>	2.2	B
17	237	<i>Life Science (Biology)</i>	1	C
18	238	<i>Life Science (Biology)</i>	4	
19	238	<i>Physical Science (Chemistry and Physics)</i>	3	
20	239	<i>Earth and Space Science</i>	2	C
21	239	<i>Life Science (Biology)</i>	7	D
22	239	<i>Physical Science (Chemistry and Physics)</i>	12	B
23	240	<i>Technology/Engineering</i>	2.3	D
24	240	<i>Life Science (Biology)</i>	7	A
25	240	<i>Physical Science (Chemistry and Physics)</i>	2	C
26	241	<i>Physical Science (Chemistry and Physics)</i>	9	C
27	241	<i>Earth and Space Science</i>	10	A
28	241	<i>Earth and Space Science</i>	11	C
29	242	<i>Earth and Space Science</i>	4	A
30	242	<i>Physical Science (Chemistry and Physics)</i>	5	C
31	243	<i>Life Science (Biology)</i>	6	D
32	244	<i>Earth and Space Science</i>	9	C
33	244	<i>Physical Science (Chemistry and Physics)</i>	11	D
34	244	<i>Technology/Engineering</i>	2.1	B
35	245	<i>Physical Science (Chemistry and Physics)</i>	4	C
36	245	<i>Earth and Space Science</i>	6	D
37	246	<i>Earth and Space Science</i>	4	
38	247	<i>Technology/Engineering</i>	2.1	
39	248	<i>Life Science (Biology)</i>	6	

* 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.