
XVII. Science and Technology/Engineering,
Grade 8

Grade 8 Science and Technology/Engineering Test

The spring 2015 grade 8 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 6–8 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 32–33)
- Life Science (Biology) (*Framework*, pages 51–53)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 67–68)
- Technology/Engineering (*Framework*, pages 87–89)

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 8 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.

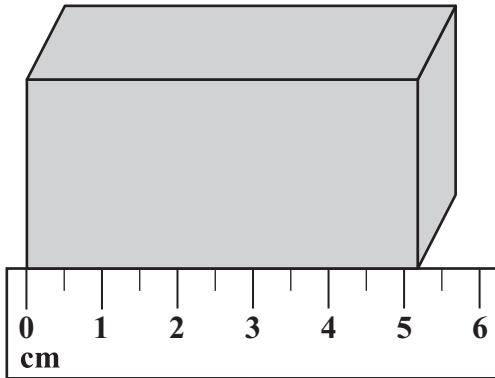
Grade 8 Science and Technology/Engineering

SESSION 1

DIRECTIONS

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

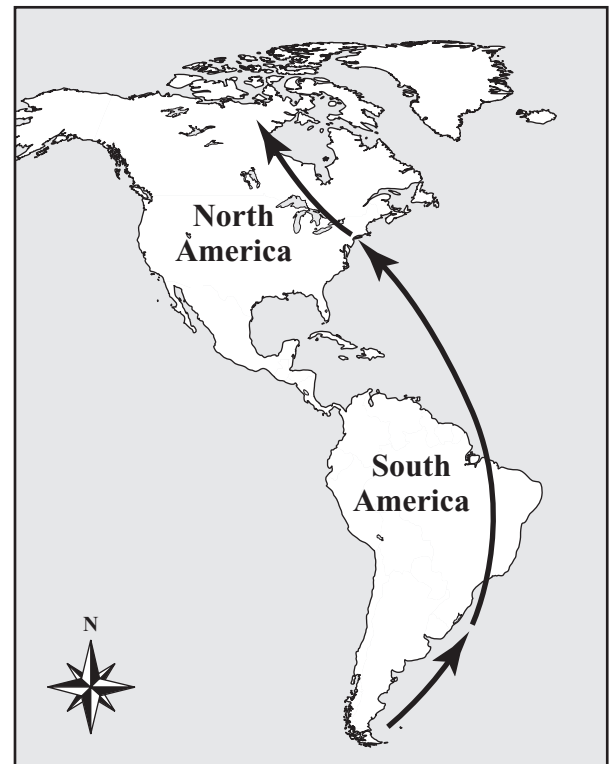
- 1 A student is measuring the length of the object shown in the picture below.



Which of the following rulers should the student use to measure the length of the object more precisely?

- A. a ruler that is longer
- B. a ruler that is also marked in inches
- C. a ruler that is marked in millimeters
- D. a ruler that has zero exactly at the end

- 2 A species of bird migrates from South America across the Atlantic Ocean to its summer breeding ground in northern Canada. The birds stop on the east coast of the United States to eat the eggs of horseshoe crabs. The migration route of these birds is shown on the map below.



Which of the following changes would **most** threaten this species of bird with extinction?

- A. less rainfall in South America
- B. longer summers in North America
- C. increased sizes of horseshoe crab eggs
- D. decreased populations of horseshoe crabs

- 3 A natural process is represented in the box below.

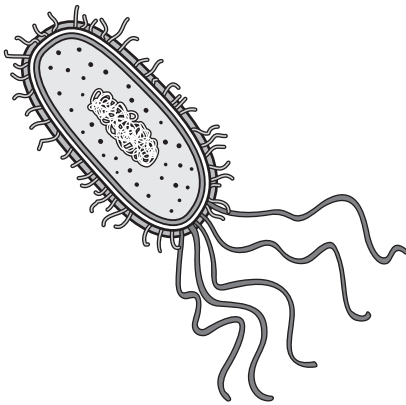
sunlight + carbon dioxide + water \longrightarrow sugar + oxygen

Which of the following processes is represented in the box?

- A. decomposition
- B. metamorphosis
- C. photosynthesis
- D. respiration

- 4 The freezing point of nitrous oxide is -91°C . Which of the following statements best describes the effect on the particles in liquid nitrous oxide as its temperature is lowered to -91°C ?
- A. The speed of the particles decreases.
 - B. The particles begin to move in a straight line.
 - C. The particles begin to move with a greater force.
 - D. The motion of the particles becomes more random.

- 5 An illustration of a bacterium is shown below.



Based on the illustration, which of the following can be concluded about the bacterium?

- A. It is unable to move.
- B. It is made up of one cell.
- C. It is the same as a vacuole.
- D. It is missing genetic material.

- 6 Which of the following statements **best** describes the role of gravity in the formation of stars?
- A. Gravity converts solid matter into gases and light energy.
 - B. Gravity causes gases and dust particles to condense into spheres.
 - C. Gravity cools gases and liquids until they become one solid mass.
 - D. Gravity pushes rocks and dust particles outward from a dense center.

- 7 A student heats two pans of water on a stove using the highest setting. One pan contains 1 L of water and the other pan contains 3 L of water. The student heats each pan until the water boils.

Which of the following statements **best** describes what happens to the water in the pans?

- A. The water in both pans boils at the same time.
- B. The water in both pans boils at the same temperature.
- C. The 3 L of water gets hotter than the 1 L of water before boiling.
- D. The 3 L of water absorbs heat more quickly than the 1 L of water.

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SESSION 2

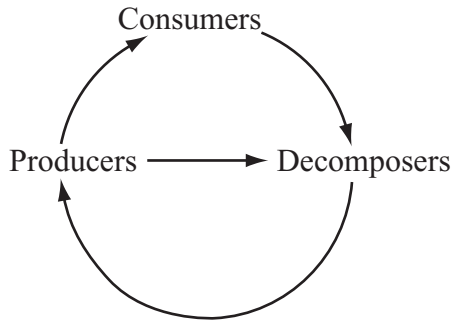
DIRECTIONS

This session contains thirteen multiple-choice questions and two open-response questions.

Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 8 Warm air masses that rise over Earth's equator move north or south. This movement is **primarily** the result of which of the following processes?
- A. conduction
 - B. convection
 - C. insulation
 - D. radiation
- 9 A company is designing a new laptop computer. The computer must not exceed a certain weight. Which of the following is the **most likely** reason to have a weight restriction for the computer?
- A. to make it easier to test the prototype
 - B. to reduce the cost of making the computer
 - C. to make it easier to transport the computer
 - D. to reduce the cost of building the prototype

- 10 The diagram below represents a cycle in an ecosystem.



Which of the following do the arrows **most likely** represent?

- A. heat
- B. nutrients
- C. sunlight
- D. water

- 11 Which of the following **best** describes the mass of a solid block of ice?
- A. the amount of matter in the block
 - B. the amount of space the block takes up
 - C. the force of gravity acting on the block
 - D. the distance between the molecules in the block

- 12 Which of the following statements **best** describes how the use of interchangeable parts has affected car manufacturing?

- A. The number of cars produced has decreased.
- B. The need for custom manufacturing has increased.
- C. The efficiency of manufacturing plants has increased.
- D. The number of countries producing cars has decreased.

- 13 Euglena is a single-celled photosynthetic organism. Clover is a multicellular green plant.

Which of the following activities is carried out by **both** euglena and clover?

- A. using light energy to produce sugar
- B. producing sex cells for reproduction
- C. moving nutrients to specialized tissues
- D. transmitting impulses along nerve pathways

- 14 A species of moth in England has both a light-colored form and a dark-colored form.

In the mid-1800s, the percentage of dark-colored moths increased in areas where black soot from factories covered the trees. The soot in these areas has decreased in more recent times as a result of pollution laws.

Which of the following statements describes what has **most likely** happened to the moth populations in these areas?

- A. The moth populations went extinct.
- B. The moth populations migrated south.
- C. The percentage of light-colored moths in the populations decreased.
- D. The percentage of dark-colored moths in the populations decreased.

- 15 The pictures below show the estimated locations of landmasses on Earth 225 million years ago and their present day locations.

225 Million Years Ago



Present Day

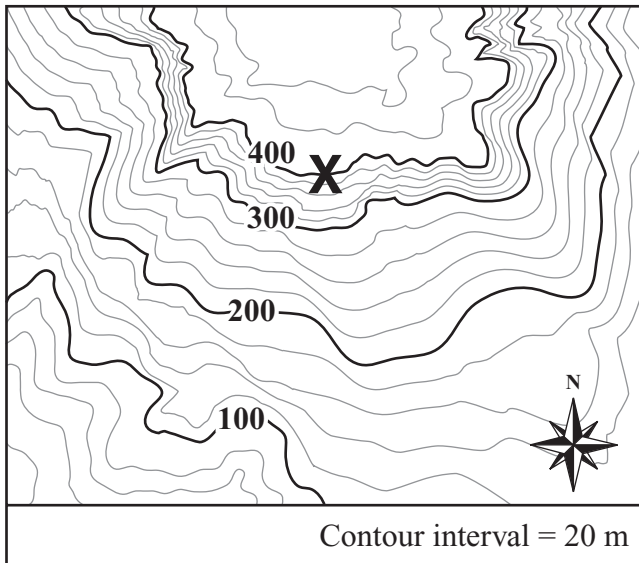


Which of the following processes caused the breakup and relocation of the landmasses over time?

- A. tectonic plate motion
- B. strong ocean currents
- C. erosion and sedimentation
- D. volcanic eruptions and weathering

- 16 A scientist is comparing two body cells of a multicellular organism. Which of the following is most likely identical?
- A. shape of cell walls
 - B. number of mitochondria
 - C. shape of cell membranes
 - D. number of chromosomes
- 17 A hearing aid is a small device that contains an amplifier, a battery, a microphone, and a speaker. Which part of a hearing aid functions to detect sounds in the user's environment?
- A. the amplifier
 - B. the battery
 - C. the microphone
 - D. the speaker
- 18 Which of the following combinations is a mixture rather than a compound?
- A. oxygen and nitrogen in air
 - B. sodium and chlorine in salt
 - C. hydrogen and oxygen in water
 - D. nitrogen and hydrogen in ammonia

- 19 The **X** on the map below shows the location of a physical feature.



Which of the following is **most likely** marked by the **X** on the map?

- A. a cliff
- B. a plain
- C. a river
- D. a valley

- 20 The temperature in a classroom is 15°C (59°F). The teacher turns the thermostat to 20°C (68°F) and keeps the door closed.

Which of the following statements best describes the change that occurs as the temperature in the room increases to 20°C ?

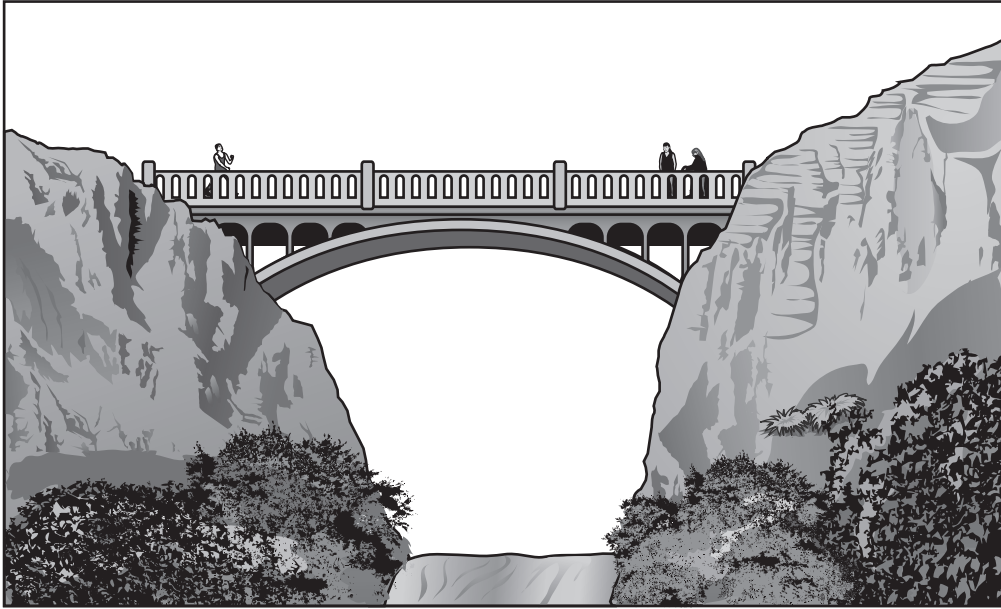
- A. Cold air molecules collide to generate heat energy.
- B. Cold energy in the room transforms into heat energy.
- C. The room becomes warmer as heat energy is added to the room.
- D. The room becomes warmer as cold energy is pushed out of the room.

Questions 21 and 22 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 21 in the space provided in your Student Answer Booklet.

- 21 The picture below shows a concrete bridge over a mountain stream in a scenic park.

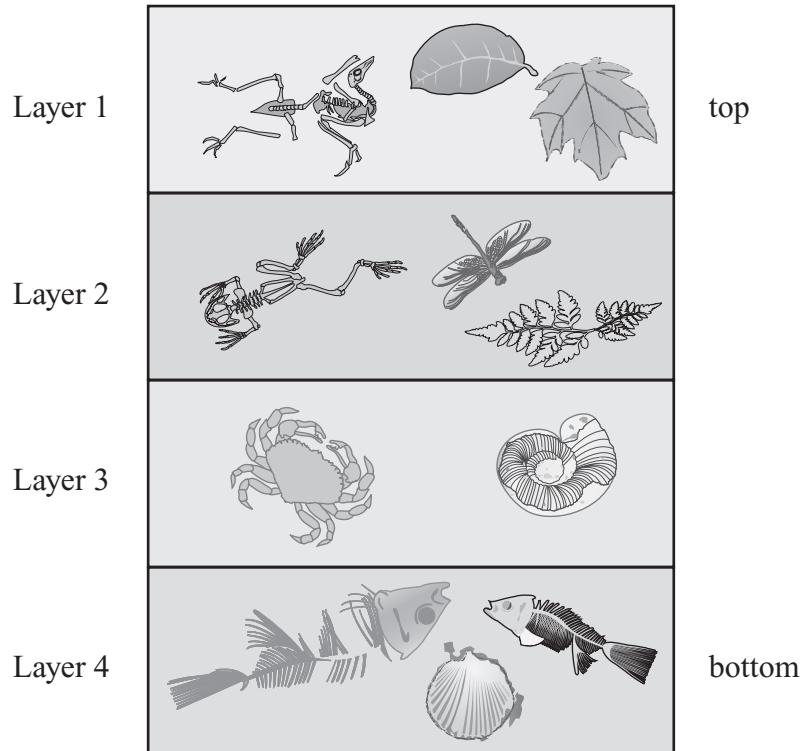


The bridge is designed for people to use to walk from the rock cliff on one side of the stream to the rock cliff on the other side.

- a. There are three major types of bridges. Identify the type of bridge shown in the picture.
- b. Explain **one** reason why the type of bridge shown in the picture is appropriate for the site where it was built.
- c. Engineers calculated the maximum load the bridge can hold. Identify **two** factors that contribute to the load the bridge can hold.

Write your answer to question 22 in the space provided in your Student Answer Booklet.

- 22 Scientists can learn how the environment in an area has changed over time by studying the fossils found in that area. The diagram below shows some of the fossils found in undisturbed rock layers in an area.



- Identify the **oldest** layer of rock found in this area.
- Explain why the layer you identified in part (a) is the oldest found in this area.
- Based on the fossils in each rock layer, describe how the environment in the area has changed over time. Include evidence from the diagram to support your answer.

Grade 8 Science and Technology/Engineering
Spring 2015 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	282	<i>Physical Sciences</i>	3	C
2	282	<i>Life Science</i>	12	D
3	283	<i>Life Science</i>	16	C
4	284	<i>Physical Sciences</i>	15	A
5	284	<i>Life Science</i>	2	B
6	284	<i>Earth and Space Science</i>	8	B
7	284	<i>Physical Sciences</i>	9	B
8	285	<i>Earth and Space Science</i>	3	B
9	285	<i>Technology/Engineering</i>	2.5	C
10	286	<i>Life Science</i>	15	B
11	286	<i>Physical Sciences</i>	2	A
12	286	<i>Technology/Engineering</i>	4.2	C
13	287	<i>Life Science</i>	4	A
14	287	<i>Life Science</i>	10	D
15	288	<i>Earth and Space Science</i>	5	A
16	289	<i>Life Science</i>	8	D
17	289	<i>Technology/Engineering</i>	7.1	C
18	289	<i>Physical Sciences</i>	8	A
19	290	<i>Earth and Space Science</i>	1	A
20	290	<i>Physical Sciences</i>	14	C
21	291	<i>Technology/Engineering</i>	5.2	
22	292	<i>Earth and Space Science</i>	7	

* 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 8 Science and Technology/Engineering
Spring 2015 Unreleased Common Items:
Reporting Categories and Standards**

Item No.	Reporting Category	Standard
23	<i>Earth and Space Science</i>	11
24	<i>Physical Sciences</i>	4
25	<i>Physical Sciences</i>	11
26	<i>Life Science</i>	9
27	<i>Life Science</i>	3
28	<i>Earth and Space Science</i>	6
29	<i>Physical Sciences</i>	5
30	<i>Technology/Engineering</i>	2.6
31	<i>Earth and Space Science</i>	2
32	<i>Earth and Space Science</i>	4
33	<i>Physical Sciences</i>	13
34	<i>Life Science</i>	13
35	<i>Technology/Engineering</i>	3.3
36	<i>Life Science</i>	18
37	<i>Earth and Space Science</i>	10
38	<i>Technology/Engineering</i>	2.1
39	<i>Technology/Engineering</i>	1.3
40	<i>Earth and Space Science</i>	9
41	<i>Technology/Engineering</i>	2.4
42	<i>Technology/Engineering</i>	6.1