
XVII. Science and Technology/Engineering,
Grade 8

Grade 8 Science and Technology/Engineering Test

The spring 2009 grade 8 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 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 *Science and Technology/Engineering Curriculum Framework* is available on the Department website 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 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

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 released item's reporting category and the *Framework* learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the table.

Science and Technology/Engineering

SESSION 1

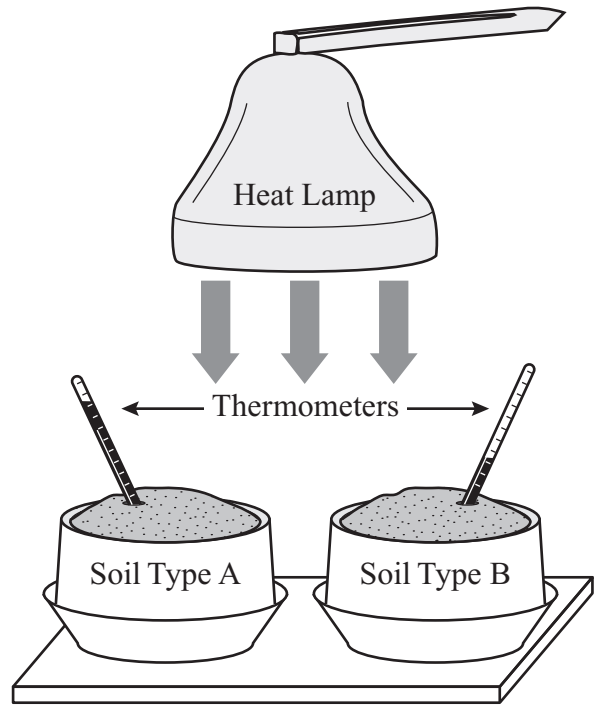
DIRECTIONS

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

- 1 If a solid object is taken from Earth far into space, which of the following measurements of the object will change **most**?
- A. density
 - B. mass
 - C. volume
 - D. weight
- 2 Sherry is going to use her computer to draw a three-dimensional box. She wants to be able to specify the exact dimensions and angles and to rotate the box as needed on the screen.
- Which of the following types of programs would Sherry **most likely** use for this purpose?
- A. word processing software
 - B. math spreadsheet program
 - C. Internet-based search engine
 - D. computer-aided design program
- 3 Which of the following statements **best** explains why it is warmer at the equator than at the North Pole?
- A. The equator has a larger area than the North Pole.
 - B. The equator is closer to the Sun than the North Pole.
 - C. The equator receives more direct sunlight than the North Pole.
 - D. The equator has more hours of daylight per year than the North Pole.
- 4 Seafloor spreading provides evidence of which of the following Earth processes?
- A. erosion of coastlines
 - B. weathering of mountains
 - C. movement of crustal plates
 - D. formation of sedimentary rocks

- 5 Which of the following would be **most** effective in reducing air traffic congestion at a busy airport?
- A. providing performance feedback to pilots
 - B. providing flight information to passengers
 - C. increasing the number of aircraft at the airport
 - D. increasing the number of runways at the airport

- 6 The diagram below represents an experiment on different types of soil.



The thermometers are measuring the temperature of the center of the soil samples. Which of the following is a cause of the measured difference in the temperature of the two soils?

- A. conduction within different soil types
- B. condensation within different soil types
- C. radiation emitted by different soil types
- D. convection in the air above different soil types

7 Most of the bacteria in a forest ecosystem are **best** classified as which of the following types of organisms?

- A. consumers
- B. decomposers
- C. predators
- D. producers

8 Which of the following is an example of a container that is filled with a pure substance rather than with a mixture?

- A. a tire filled with air
- B. a jar filled with salt water
- C. a balloon filled with helium
- D. a glass filled with chocolate milk

Question 9 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE 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 9 in the space provided in your Student Answer Booklet.

- 9 The planets in our solar system were formed mainly by one force. That same force affects the motion of the planets in our solar system.
- a. Identify the force that is responsible for the formation of the planets in our solar system.
 - b. Describe how the force you identified in part (a) formed the planets in our solar system.
 - c. Describe **two** other examples of the effects this force has in our solar system.

Science and Technology/Engineering

SESSION 2

DIRECTIONS

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

- 10 The table below shows the number of each kind of atom that makes up one molecule of the compounds sucrose and ethanol.

Compound	Number of Atoms per Molecule		
	Carbon	Oxygen	Hydrogen
sucrose	12	11	22
ethanol	2	1	6

Which of the following is the **same** for both compounds?

- A. the mass of each molecule
- B. the length of each molecule
- C. the types of atoms in each molecule
- D. the number of atoms in each molecule

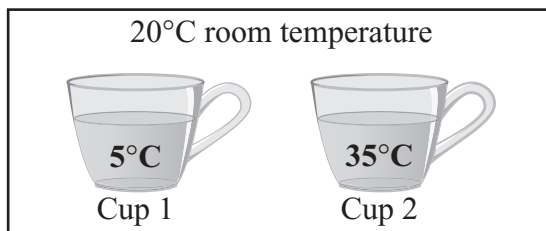
- 11 Comparing the skeletons of which of the following fish would **best** show the evolution of a fish species?

- A. a male fish and a female fish that could produce offspring
- B. the same fish just before it received a cut and after it healed
- C. a fish that lived recently and a fish that lived a long time ago
- D. the same fish just after it hatched and when it was full-grown

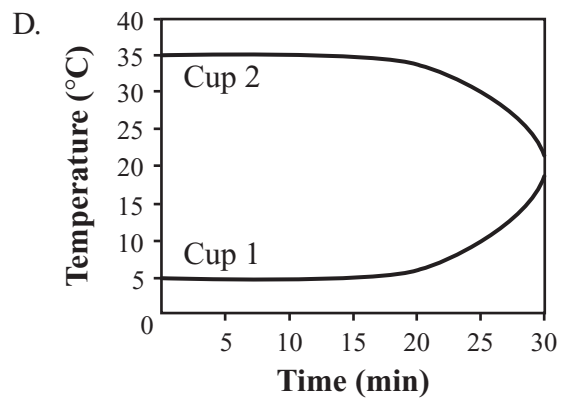
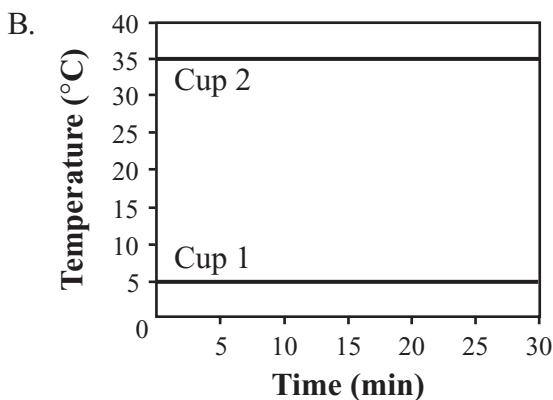
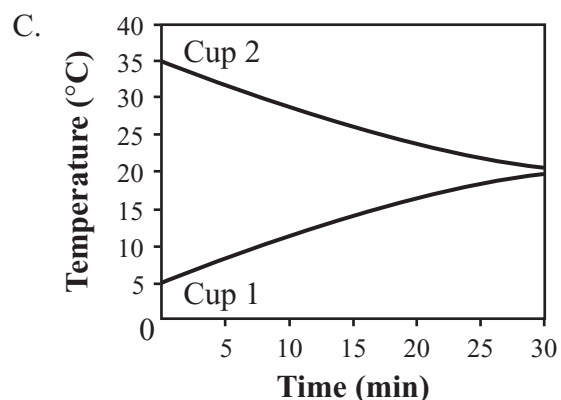
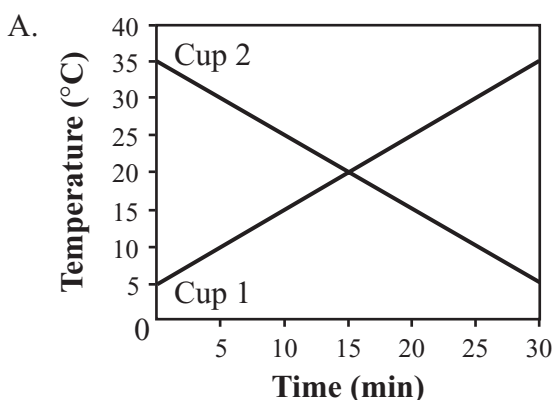
- 12 How is a skin cell from a mouse similar to an amoeba?

- A. Both need energy.
- B. Both have cell walls.
- C. Both move with pseudopodia.
- D. Both consume carbon dioxide.

- 13 During an investigation, Steven filled two cups with the same amount of water and placed them in a 20°C room for 30 minutes. Cup 1 was filled with 5°C water. Cup 2 was filled with 35°C water. The diagram below shows the temperatures of the cups at the beginning of the investigation.



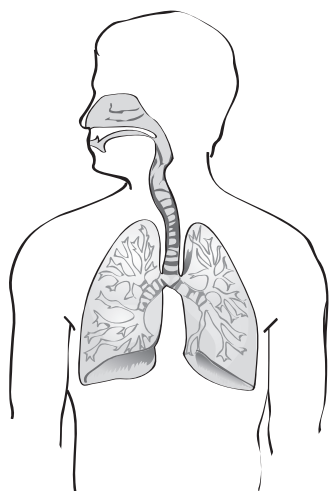
Which of the following graphs shows how the temperatures of the two cups of water **most likely** changed over 30 minutes?



14 The cows in a rancher’s herd of cattle have been selectively bred to produce milk. Which of the following will cause the next generation of cows to receive the trait for producing large quantities of milk?

- A. nutrients in the cows’ food
- B. essential minerals in the cows’ water
- C. electrical impulses in the cows’ brains
- D. information in the cows’ chromosomes

15 The diagram below shows a major system of the human body.



Which of the following **best** describes the function of this system?

- A. absorbing nutrients from food
- B. protecting the body from infection
- C. exchanging gases with the environment
- D. responding to stimuli in the environment

16 The picture below shows a demonstration of water changing from the liquid phase to the gas phase as it boils in a beaker.



Which of the following statements explains why this demonstration **cannot** be used to prove that matter is conserved during a change of phase?

- A. The change of phase is incomplete.
- B. Water is changing both phase and temperature.
- C. Water in the gas phase is lighter than liquid water.
- D. The change of phase is taking place in an open system.

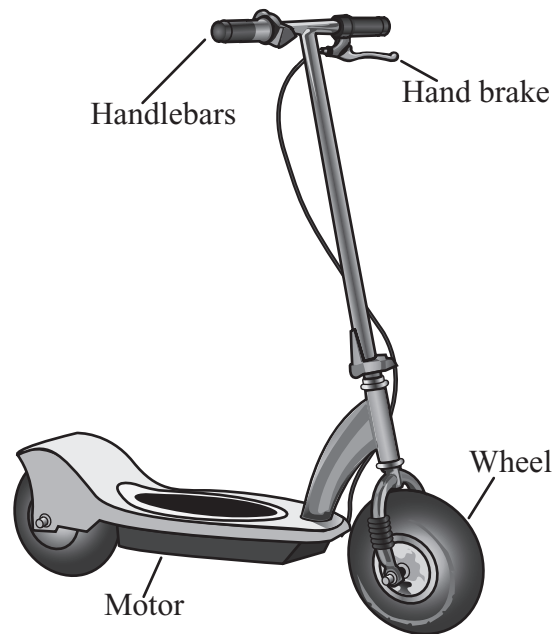
- 17 Which of the following materials are direct products of photosynthesis?
- A. fats and starches
 - B. oxygen and sugar
 - C. proteins and amino acids
 - D. carbon dioxide and water
- 18 A student is given a sample of an unknown liquid to test in the laboratory. The student thinks that the liquid is water. Which of the following physical properties of the sample is **most** helpful to determine if the liquid is water?
- A. color of the liquid
 - B. mass of the liquid
 - C. volume of the liquid
 - D. boiling point of the liquid

Question 19 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE 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 19 in the space provided in your Student Answer Booklet.

19 Parts of a scooter are labeled in the diagram below.



- Identify the subsystem (propulsion, guidance, control, or suspension) to which **each** of the four labeled parts belongs.
- Identify **one** important property of the material used to make the wheel.
- Explain why the property you identified in part (b) is important for the scooter.

**Grade 8 Science and Technology/Engineering
Spring 2009 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	254	<i>Physical Sciences (Chemistry and Physics)</i>	1	D
2	254	<i>Technology/Engineering</i>	3.2	D
3	254	<i>Earth and Space Science</i>	11	C
4	254	<i>Earth and Space Science</i>	5	C
5	255	<i>Technology/Engineering</i>	6.2	D
6	255	<i>Earth and Space Science</i>	3	A
7	256	<i>Life Science (Biology)</i>	14	B
8	256	<i>Physical Sciences (Chemistry and Physics)</i>	8	C
9	257	<i>Earth and Space Science</i>	8	
10	258	<i>Physical Sciences (Chemistry and Physics)</i>	5	C
11	258	<i>Life Science (Biology)</i>	11	C
12	258	<i>Life Science (Biology)</i>	4	A
13	259	<i>Physical Sciences (Chemistry and Physics)</i>	16	C
14	260	<i>Life Science (Biology)</i>	7	D
15	260	<i>Life Science (Biology)</i>	6	C
16	260	<i>Physical Sciences (Chemistry and Physics)</i>	4	D
17	261	<i>Life Science (Biology)</i>	16	B
18	261	<i>Physical Sciences (Chemistry and Physics)</i>	9	D
19	262	<i>Technology/Engineering</i>	6.3	

* 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 website later this year.