XVII. Science and Technology/Engineering, Grade 8
Grade 8 Science and Technology/Engineering Test


- 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

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

1. The satellite image below shows a natural feature on Earth’s surface. The feature is marked X on the image.

Which action most likely helped form feature X?

A. Wind blew sand from the beach into large piles.
B. Sediments were deposited where the river met the ocean.
C. Waves pushed mud from the bottom of the ocean onto land.
D. Land was exposed when water was pulled offshore during low tide.

2. The picture below shows an airplane wing with the flaps down.

A pilot lowers the flaps before takeoff to increase which of the following forces?

A. drag
B. gravity
C. lift
D. thrust
The diagram below shows the outline of a box that is closed on all sides.

Which of the following patterns could be used to create the box?

A. 
B. 
C. 
D. 
4. The table below shows the mass and the weight of a certain object on Earth.

<table>
<thead>
<tr>
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<th>Weight (N)</th>
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<tbody>
<tr>
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<td>60</td>
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</tbody>
</table>

The force of gravity on the Moon is about one-sixth the force of gravity on Earth. What are the approximate mass and approximate weight of the same object on the Moon?

A. | Mass (kg) | Weight (N) |
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<tbody>
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B. | Mass (kg) | Weight (N) |
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C. | Mass (kg) | Weight (N) |
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<td>360</td>
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</table>

D. | Mass (kg) | Weight (N) |
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<tr>
<td>36.0</td>
<td>360</td>
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</table>

5. The diagram below shows Earth, four different positions of the Moon, and the direction of incoming sunlight.

In which position would the Moon appear as a full moon as seen from Earth?

A. position 1  
B. position 2  
C. position 3  
D. position 4
The “Ring of Fire” is a long chain of volcanoes that encircles the Pacific Ocean. Which of the following is the best explanation for the arrangement of these volcanoes?

A. They outline the crater caused by the impact of an asteroid.
B. They follow the shape of the adjacent tectonic plates under the sea.
C. One volcano usually triggers a second volcano with its hot magma.
D. Volcanoes always form in rings because of underwater convection currents.

The shelves were built to help store the boxes so the contents of the boxes can be found more easily. Which of the following problems was solved by building shelves?

A. organizing the use of space
B. limiting the shape of the boxes
C. increasing the size of the closet
D. equalizing the weight of the boxes
8. Which of the following is the most important function of the research and development department of a large corporation?

A. to create, test, and improve products
B. to manage the manufacturing of products
C. to persuade customers to buy the products
D. to label, package, and send products to retail stores
Dead plant and animal matter are broken down by different organisms. This decay process benefits other organisms in the ecosystem.

a. Name **two** different organisms that help break down dead plant and animal matter.

b. Describe how living plants benefit from the breakdown of dead plant and animal matter.

c. Explain what would **most likely** happen to an ecosystem if all the organisms that break down dead plant and animal matter suddenly disappeared.
Write your answer to question 10 in the space provided in your Student Answer Booklet.

10 A group of students do an activity with baking soda and vinegar. The steps of the activity are listed below.

1. Pour 100 g of vinegar into a flask.
2. Measure the temperature of the vinegar.
3. Add 10 g of baking soda to the flask.
4. Observe as the contents of the flask fizz (produce bubbles).
5. Measure the temperature of the contents of the flask and observe any change in temperature.

a. Describe one piece of evidence that a chemical reaction occurs when baking soda is added to vinegar.

b. What should be the total mass of all the products of the reaction? Show your calculations or explain your answer, and include units in your answer.

After the fizzing stops, the students determine that the liquid in the flask has a mass of 105 g.

c. Describe how to change the activity to show that the total mass of all the products is the value you calculated in part (b). Explain your reasoning.
Grade 8 Science and Technology/Engineering

SESSION 2

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

11. At one station in a production line, a worker must drill a hole in each end of wooden boards. At the next station, another worker attaches two of the boards together using metal fasteners that fit in the holes.

Which of the following processes will ensure that the wooden boards fit together with the fewest errors?

A. placing the parts on a conveyor belt to keep them moving quickly
B. using a fixture to hold the boards in place as the holes are drilled
C. inspecting the boards after they are attached to each other
D. installing equipment to protect workers from debris

12. Which of the following diagrams best represents the angle at which the Sun’s rays strike location X at noon on June 21?

A. [Diagram A]
B. [Diagram B]
C. [Diagram C]
D. [Diagram D]
13 Carbon dioxide produced by cells is removed from the body **primarily** by which body system?

A. digestive  
B. excretory  
C. immune  
D. respiratory

14 A student uses the following characteristics to describe a group of objects in space.

- 200 billion stars  
- 30 million light years from Earth  
- 500 light years in diameter

Which of the following is the student **most likely** describing?

A. a galaxy  
B. the universe  
C. a constellation  
D. the solar system

15 Which of the following diagrams **best** represents two different elements combining to form a compound?

A. \( X + X = X \ X \)  
B. \( X + Z = X \ Z \)  
C. \( Z + Z = Z \ Z \)  
D. \( Z + Z = Z \ Z \)
16. Just before sunset, a student recorded the temperature of the air and the soil at the same location. The student found that the air and the soil had the same temperature.

Which of the following statements describes how the air and soil temperatures most likely changed after sunset on that day?

A. The soil temperature increased more quickly than the air temperature.
B. The air temperature increased more quickly than the soil temperature.
C. The soil temperature decreased more quickly than the air temperature.
D. The air temperature decreased more quickly than the soil temperature.

17. Which of the following is an example of asexual reproduction?

A. Turtles lay fertilized eggs in a pit in the sand.
B. Seeds form in pine cones after pollen reaches the cones.
C. Fish release egg cells and sperm cells at the surface of the water.
D. Trees send out rootlike extensions that produce new stems.

18. The graph below represents the motion of a runner during a 2000-meter race.

Motion of Runner

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<td>2000</td>
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During which of the following time periods is the runner’s speed constant?

A. 0–8 min
B. 2–8 min
C. 4–8 min
D. 6–8 min
19. Which of the following statements **best** describes the process of natural selection in a population?

A. All individuals develop traits to match changes to their environment.
B. All individuals learn to adapt to specific changes that occur slowly in their environment.
C. Some individuals respond to their environment by mutating to make themselves more likely to survive.
D. Some individuals have genetic differences that make them more likely to survive and reproduce in their environment.

20. The students in a class would like to make 20 paper sailboats for a race. The students will select one design and collect the materials they need to construct the boats.

Which of the following is the **best** way for the students to be sure the paper sailboats will float without tipping over in the water?

A. construct a prototype of a boat for testing
B. calculate the total mass of all of the finished boats
C. determine the total amount of weight each boat can carry
D. test the strength of each material used to construct the boats

21. Which of the following has a warmer **average** surface temperature than Earth?

A. Mars
B. Moon
C. Pluto
D. Venus
Grade 8 Science and Technology/Engineering
Spring 2014 Released Items:
Reporting Categories, Standards, and Correct Answers*

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* 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 2014 Unreleased Common Items:
Reporting Categories and Standards

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