

SCIENCE

Description of Test Format and Organization

The Georgia Milestones EOG assessment is primarily a criterion-referenced test, designed to provide information about how well a student has mastered the grade-level state-adopted content standards in Science. Each student will receive one of four proficiency levels, depending on how well the student has mastered the content standards. In addition to criterion-referenced information, the Georgia Milestones measures will also include a limited sample of nationally norm-referenced items to provide a signal of how Georgia students are achieving relative to their peers nationally. The norm-referenced information provided is supplementary to the criterion-referenced proficiency designation and will not be utilized in any manner other than to serve as a barometer of national comparison. Only the criterion-referenced scores and proficiency designations will be utilized in the accountability metrics associated with the assessment program (such as student growth measures, educator effectiveness measures, or the CCRPI).

The Grade 8 Science EOG assessment consists of a total of 75 selected-response items, 67 of which are operational items (and contribute to a student's criterion-referenced and/or norm-referenced score) and 8 of which are field test items (newly written items that are being tried out and do not contribute to the student's score). The criterion-referenced score, and proficiency designation, is comprised of 55 items, for a total of 55 points. Of the 67 operational items, 20 will be norm-referenced and will provide a national comparison in the form of a national percentile rank. Eight of the items have been verified as aligned to the course content standards by Georgia educators and will therefore contribute to the criterion-referenced proficiency designation. The other 12 items will contribute only to the national percentile rank and be provided as supplemental information. Only items that are aligned to the state-adopted content standards will be utilized to inform the criterion-referenced score.

With the inclusion of the norm-referenced items, students may encounter items for which they have not received direct instruction. These items will not contribute to the student's criterion-referenced proficiency designation; only items that align to the course content standards will contribute to the criterion-referenced score. Students should be instructed to try their best should they ask about an item that is not aligned to the content they have learned as part of the course.

Grade 8 Science EOG Assessment Design

Description	Number of Items	Points for CR ¹ Score	Points for NRT ² Feedback
CR Selected-Response Items	47	47	0
NRT Selected-Response Items	20 ³	8 ⁴	20
CR Field Test Items	8	0	0
Total Items/Points⁵	75	55	20

¹CR—Criterion-Referenced: items aligned to state-adopted content standards

²NRT—Norm-Referenced Test: items that will yield a national comparison; may or may not be aligned to state-adopted content standards

³Of these items, 8 will contribute to both the CR scores and NRT feedback. The other 12 of these items will contribute to NRT feedback only and will not impact the student's proficiency designation, scale score, or grade conversion.

⁴Alignment of national NRT items to course content standards was verified by a committee of Georgia educators. Only approved, aligned NRT items will contribute to a student's CR proficiency designation, scale score, and grade conversion score.

⁵Total number of items contributing to CR score: 55; total points: 55; total number of items contributing to NRT feedback: 20; total points: 20

The test will be given in two sections. Students may have up to 70 minutes per section to complete Sections 1 and 2. The total estimated testing time for the Grade 8 Science EOG assessment ranges from approximately 100 to 140 minutes. Total testing time describes the amount of time students have to complete the assessment. It does not take into account the time required for the test examiner to complete pre-administration and post-administration activities (such as reading the standardized directions to students). Sections 1 and 2 must be scheduled to be administered on the same day in one test session following the district's testing protocols for the EOG measures (in keeping with state guidance).

Content Measured

The Grade 8 Science assessment will measure the standards that are enumerated for Grade 8 as described on www.georgiastandards.org.

The content of the assessment is organized into three groupings, or domains, of standards for the purposes of providing feedback on student performance. A content domain is a reporting category that *broadly* describes and defines the content of the course, as measured by the EOG assessment. The standards for Grade 8 Science are grouped into three domains: Structure of Matter, Force and Motion, and Energy and Its Transformation. Each domain was created by organizing standards that share similar content characteristics. The content standards describe the level of expertise that Grade 8 Science educators should strive to develop in their students. Educators should refer to the content standards for a full understanding of the knowledge, concepts, and skills subject to be assessed on the EOG assessment.

The approximate proportional number of points associated with each domain is shown in the following table. A range of cognitive levels will be represented on the Grade 8 Science EOG assessment. Educators should always use the content standards when planning instruction.

Grade 8 Science: Domain Structures and Content Weights

Domain	Standard	Approximate Weight
Structure of Matter	S8P1 (1a, 1b, 1c, 1d, 1e, 1f, 1g)	30%
Force and Motion	S8P3 (3a, 3b, 3c) S8P5 (5a, 5c)	30%
Energy and Its Transformation	S8P2 (2a, 2b, 2c, 2d) S8P4 (4a, 4b, 4c, 4d, 4e, 4f) S8P5 (5b)	40%

Item Types

The Science portion of the Grade 8 EOG assessment consists of selected-response items only.

A selected-response item, sometimes called a multiple-choice item, is defined as a question, problem, or statement that appears on a test followed by several answer choices, sometimes called options or response choices. The incorrect choices, called distractors, usually reflect common errors. The student's task is to choose, from the alternatives provided, the best answer to the question posed in the stem (the question). The Science selected-response items will have four answer choices.

Science Example Items

Example items, which are representative of three DOK levels across various Grade 8 Science content domains, are provided on the following pages. **All example and sample items contained in this guide are the property of the Georgia Department of Education.**

Example Item 1**DOK Level:** 1**Science Grade 8 Content Domain:** Structure of Matter**Standard:** S8P1. Students will examine the scientific view of the nature of matter. a. Distinguish between atoms and molecules.**Which of these BEST describes an atom?**

- A** A particle of matter that carries an overall positive charge.
- B** A particle of matter that is formed by the bonding of two or more molecules.
- C** The smallest particle of an element that shows all the properties of that element.
- D** The smallest particle of an element that can be broken down further to form molecules.

Correct Answer: C

Explanation of Correct Answer: The correct answer is choice (C) The smallest particle of an element that shows all the properties of that element. Although atoms can be broken down into subatomic particles, subatomic particles do not show all the properties of elements. Choice (A) is incorrect because this defines one kind of ion, not an element. Choices (B) and (D) are incorrect because atoms bond to form molecules, which bond to form larger molecules.

Example Item 2**DOK Level:** 2**Science Grade 8 Content Domain:** Energy and Its Transformation**Standard:** S8P5. Students will recognize characteristics of gravity, electricity, and magnetism as major kinds of forces acting in nature. b. Demonstrate the advantages and disadvantages of series and parallel circuits and how they transfer energy.**Light bulbs on a string of lights are connected using parallel circuits.****Which of these BEST explains why parallel circuits are used instead of series circuits?**

- A** Parallel circuits use less energy.
- B** Parallel circuits are easier to make.
- C** If one light goes out on a parallel circuit, no other lights go out.
- D** If one light goes out on a parallel circuit, all the other lights will go out.

Correct Answer: C

Explanation of Correct Answer: The correct answer is choice (C) If one light goes out on a parallel circuit, no other lights go out. A parallel circuit contains multiple branches through which current may travel. If a light on one branch goes out, current will still reach lights on the other branches. Choices (A) and (B) are incorrect because compared to series circuits, parallel circuits do not use less energy, nor are they easier to make. Choice (D) is incorrect because the opposite is true: If one light goes out on a parallel circuit, the other lights do not go out.

Example Item 3

DOK Level: 2

Science Grade 8 Content Domain: Energy and Its Transformation

Standard: S8P4. Students will explore the wave nature of sound and electromagnetic radiation. a. Identify the characteristics of electromagnetic and mechanical waves.

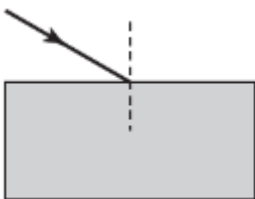
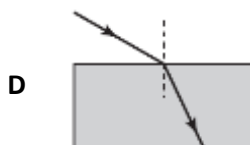
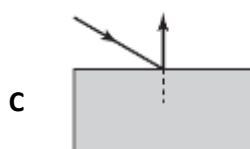
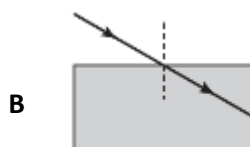
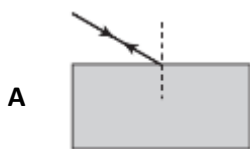
Many movies have shown scenes where explosions can be seen and heard in outer space.

Which statement BEST describes why these scenes are not correct?

- A** Sound waves are unable to travel in outer space.
- B** Light waves travel too slowly to be seen in outer space.
- C** Light and sound travel at different speeds in outer space.
- D** Light and sound travel in different directions in outer space.

Correct Answer: A

Explanation of Correct Answer: The correct answer is choice (A) Sound waves are unable to travel in outer space. Sound waves are caused by vibrating particles. In the vacuum of space, there are essentially no particles to vibrate; therefore, explosions in outer space may be seen but not heard. Choice (B) is incorrect because no waves travel faster than light waves in the vacuum of space. Choices (C) and (D) are incorrect because sound waves cannot travel at all through outer space.

Example Item 4**DOK Level:** 3**Science Grade 8 Content Domain:** Energy and Its Transformation**Standard:** S8P4. Students will explore the wave nature of sound and electromagnetic radiation. b. Describe how the behavior of light waves is manipulated causing reflection, refraction, diffraction, and absorption.**A student is drawing a diagram of a light ray as it enters a pane of glass.****Which of these shows the correctly completed diagram?****Correct Answer:** D**Explanation of Correct Answer:** The correct answer is choice (D) the diagram that shows the light ray bending, or refracting, as it enters the pane of glass. As a light ray moves from one medium into another, the ray changes speed. If the light ray enters the new medium at an angle other than 0° from the normal (represented in this diagram by the dashed line), this change of speed causes the ray to

change direction. Choices (A) and (C) are incorrect because glass is transparent: light rays pass through glass; they are not reflected off glass. Choice (B) is incorrect because the light ray in this diagram enters the glass at an angle other than 0° from the normal; therefore, it will change direction as it changes medium.

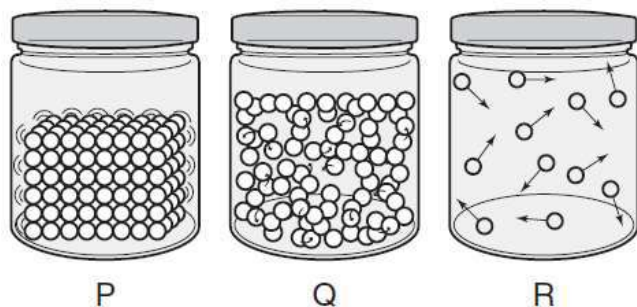
Example Item 5

DOK Level: 3

Science Grade 8 Content Domain: Structure of Matter

Standard: S8P1. Students will examine the scientific view of the nature of matter. c. Describe the movement of particles in solids, liquids, gases, and plasmas states.

The three jars show the movement of particles in three states of matter.



Dry ice is solid carbon dioxide. As dry ice is heated, it goes directly from a solid to a gas through a process called sublimation.

Which sequence of jars shows the change in the motion of particles of dry ice as it sublimates?

- A jar P to jar Q
- B jar P to jar R
- C jar Q to jar R
- D jar R to jar P

Correct Answer: B

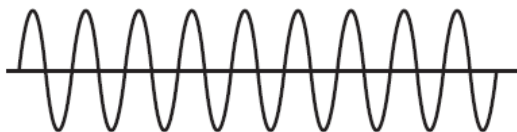
Explanation of Correct Answer: The correct answer is choice (B) jar P to jar R. Jar P represents a solid: the particles are arranged in orderly, fixed positions. Jar R represents a gas: the particles move freely past each other, and there is lots of space between them. Choices (A) and (C) are incorrect because jar Q represents a liquid: the particles slide around each other, but they remain close together. Choice (D) is incorrect because sublimation happens when a solid (jar P) becomes a gas (jar R), not the reverse.

Science Additional Sample Items

This section has two parts. The first part is a set of 10 sample items for the Science portion of the EOG assessment. The second part contains a table that shows for each item the standard assessed, the DOK level, the correct answer (key), and a rationale/explanation about the key and distractors. The sample items can be utilized as a mini-test to familiarize students with the item formats found on the assessment. **All example and sample items contained in this guide are the property of the Georgia Department of Education.**

Item 1

A machine converts sound into a transverse wave as shown.



If the sound becomes louder, what would the new sound wave look like?

- A

A transverse wave with a smaller amplitude than the original wave, but the same frequency.
- B

A transverse wave with a larger amplitude than the original wave, but the same frequency.
- C

A transverse wave with a larger amplitude and a higher frequency than the original wave.
- D

A transverse wave with a larger amplitude and a lower frequency than the original wave.

Item 2

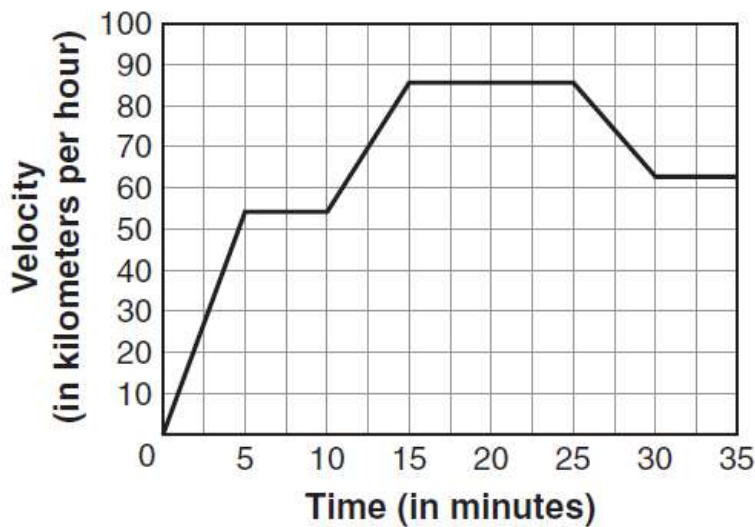
A student is heating water to make hot chocolate. He begins thinking about the effect of heating on the particles of water.

Which of these statements correctly describes how the particles of water are affected as the water is heated?

- A The particles start moving faster.
- B The particles start moving slower.
- C The particles start vibrating in fixed positions.
- D The particles start expanding to take up more space.

Item 3

The graph shows the velocity of a moving train over time.



During which two intervals of time was the train moving with a constant, positive acceleration?

- A 0–5 and 10–15 minutes
- B 5–10 and 15–25 minutes
- C 10–15 and 25–30 minutes
- D 15–20 and 30–35 minutes

Item 4

While conducting an experiment, a student determines the gravitational force between two objects of equal mass. He uses this as his control for the experiment. He then conducts five additional experiments. He performs the experiments with the changes listed, measuring the effect of each on the gravitational force between the objects and comparing the result to the information from the control.

Experiment 1. Replace one control object with an object that is double the mass of the objects in the control at the control distance.

Experiment 2. Replace both control objects with objects that are double the mass of the objects in the control at the control distance.

Experiment 3. Using the control objects, double the distance between the objects compared to the control.

Experiment 4. Using the control objects, reduce the distance between the objects by half compared to the distance in the control.

Experiment 5. Replace one control object with an object that is half the mass of the objects in the control at the control distance.

Which pair of experiments BOTH resulted in a decrease in the gravitational force between the two objects compared to the control?

- A 1 and 3
- B 2 and 4
- C 3 and 5
- D 4 and 5

Item 5

When a roller-coaster car reaches the top of a hill and starts going downward, there is a change in the direction and speed of the car.

Which of these can also be concluded about the roller-coaster car as it is going downward?

- A Its kinetic energy decreases as its potential energy proportionally increases.
- B Its potential energy decreases as its kinetic energy proportionally increases.
- C Both its potential and kinetic energy proportionally increase.
- D Both its potential and kinetic energy proportionally decrease.

Item 6

A student performs an investigation to determine the properties of an iron nail. The list shows her findings.

The nail can rust.

The nail is denser than water.

The nail is very hard.

The nail can be bent.

Which statement is correct about the student's findings?

- A Rusting is a physical property of iron.
- B Hardness is a chemical property of iron.
- C Rusting and bending are chemical properties of iron.
- D Density and hardness are physical properties of iron.

Item 7

In order to boil an egg, a student puts the egg in a pan of water and heats the pan on the stove.

Which methods of heat transfer are used to transfer the majority of the heat to the water and to the egg?

- A radiation and convection
- B radiation and conduction
- C conduction and convection
- D conduction, convection, and radiation

Item 8

Student 1 claims that energy can only be transferred by particles inside a medium. Student 2 does not agree with Student 1.

Which statement should Student 2 use as evidence that Student 1 is INCORRECT?

- A Light energy can travel without a medium.
- B Sound energy can travel without a medium.
- C All types of energy can travel without a medium.
- D Mechanical energy can travel without a medium.

Item 9

A cart is being pushed over a smooth surface with a constant force. After five seconds, the cart starts moving over a rough surface.

How will the cart be affected once the surface changes?

- A The cart's inertia will increase.
- B The cart's velocity will increase.
- C The cart's friction will decrease.
- D The cart's acceleration will decrease.

Item 10

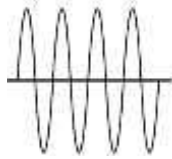
The table identifies characteristics of two substances, P and Q.

P	Q
Composed of the same type of atoms	Composed of two types of atoms
Has fixed melting point	Does not have fixed melting point

Which of these can be concluded about substances P and Q?

- A P and Q are both compounds.
- B P is an element and Q is a mixture.
- C P is a mixture and Q is a compound.
- D P is a compound and Q is an element.

Science Additional Sample Item Keys

Item	Standard/ Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
1	S8P4f	S8CS5a	3	C	 <p>The correct answer is choice (C). A sound wave's amplitude determines the volume of the sound it produces. This diagram shows waves with the same wavelengths but with greater amplitudes. Waves with greater amplitudes produce louder sounds. Choice (A) is incorrect because compared to the original waves, these waves have smaller amplitudes and wavelengths; they will produce quieter sounds with higher pitches. Choice (B) is incorrect because compared to the original waves, these waves have smaller amplitudes; they will produce quieter sounds. Choice (D) is incorrect because compared to the original waves, these waves have longer wavelengths; they will produce sounds with lower pitches.</p>
2	S8P1c	S8CS5a	2	A	<p>The correct answer is choice (A) The particles start moving faster. Heating water increases the energy of the water particles. Particles with more energy move more quickly than particles with less energy. Choice (B) is incorrect because the opposite is true; cooling the water would cause the particles to move more slowly. Choice (C) is incorrect because particles in solids vibrate in fixed positions; to become a solid, a liquid must be cooled. Choice (D) is incorrect because heat energy does not cause particles to expand.</p>
3	S8P3a	S8CS6b	2	A	<p>The correct answer is choice (A) 0-5 and 10-15 minutes. For these intervals, the graph has a constant, positive slope; this means that each minute the train's velocity increases by the same rate. Choices (B) and (D) are incorrect because for these intervals the graph's slope is flat; this means that the train is moving at a constant velocity. Choice (C) is incorrect because between 25 and 30 minutes the graph has a negative slope; during this interval of time, the train is slowing down.</p>

Item	Standard/ Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
4	S8P5a	S8CS9a	2	C	The correct answer is choice (C) 3 and 5. The gravitational force between two objects is affected by the masses of the objects and the distance between them. Increasing the distance between the objects, as in experiment 3, decreases the gravitational force between the objects, as does reducing the mass of an object, as in experiment 5. Choice (A) is incorrect because increasing an object's mass increases the gravitational force it exerts on other objects. Choices (B) and (D) are incorrect because decreasing the distance between the objects, as in experiment 4, increases the gravitational force between the objects.
5	S8P2b	S8CS5a	2	B	The correct answer is choice (B) Its potential energy decreases as its kinetic energy proportionally increases. A roller-coaster car has its greatest potential energy at the top of the hill. As the car moves down the hill, its potential energy is converted to kinetic energy. Choices (A) and (D) are incorrect because kinetic energy is the energy of motion; as the car moves down the hill, its kinetic energy increases. Choice (C) is incorrect because the car's potential energy decreases as it moves down the hill.
6	S8P1d	S8CS9a	2	D	The correct answer is choice (D) Density and hardness are physical properties of iron. An object's physical properties can be observed and measured without changing the chemical identity of the object. Choice (A) is incorrect because rusting is a chemical property; it happens only through a chemical reaction. Choice (B) is incorrect because hardness is a physical property. Choice (C) is incorrect because bending is a physical property.

Item	Standard/ Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
7	S8P2d	S8CS5a	2	C	The correct answer is choice (C) conduction and convection. Heat is transferred by conduction from the stove to the pan, from the pan to the water, and from the water to the egg; as particles in each substance vibrate, they transfer their energy to neighboring particles. Heat is also transferred by convection through the water; as water molecules gain energy, they move toward the surface of the water, and as they cool, they sink back toward the bottom of the pan. Choices (A), (B), and (D) are incorrect because radiation is energy that moves in the form of electromagnetic waves.
8	S8P4a	S8CS7a	2	A	The correct answer is choice (A) Light energy can travel without a medium. Light energy travels in the form of electromagnetic waves; because electromagnetic waves do not require a medium, they can travel through the vacuum of space. Choices (B), (C), and (D) are incorrect because mechanical waves, including sound waves, can travel only through a medium.
9	S8P3b	S8CS5a	2	D	The correct answer is choice (D) The cart's acceleration will decrease. When the cart moves over a rough surface, it will encounter more friction; due to this friction, the cart will slow down as it loses energy as heat. Choice (A) is incorrect because inertia is a body's tendency to remain at rest or in uniform motion unless the body is acted on by an external force; inertia is not changed by forces. Choice (B) is incorrect because the cart's velocity will decrease as it loses energy to the force of friction. Choice (C) is incorrect because friction is not a property of the cart; it is a force caused by the rubbing of the cart against the rough surface.