

Ohio's State Tests

ANSWER KEY & SCORING GUIDELINES

SPRING 2015

GRADE 8
SCIENCE

PART 2

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**Grade 8 Science
EOY Practice Test
Content Summary and Answer Key**

Question No.	Item Type	Content Strand	Content Statement	Answer Key	Points
1	Multiple Choice	Earth and Space Science	The composition and properties of Earth's interior are identified by the behavior of seismic waves.	C	1 point
2	Multiple Choice	Physical Science	Forces have magnitude and direction.	C	1 point
3	Multiple Choice	Physical Science	There are different types of potential energy.	D	1 point
4	Table	Physical Science	Forces between objects act when the objects are in direct contact or when they are not touching.	---	1 point
5	Multiple Choice	Physical Science	Forces between objects act when the objects are in direct contact or when they are not touching.	C	1 point
6	Evidence-Based Selected Response	Earth and Space Science	The composition and properties of Earth's interior are identified by the behavior of seismic waves.	B; A; B	1 point
7	Simulation*	Life Science	The characteristics of an organism are a result of inherited traits received from parent(s).	---	---
8	Graphic Response	Life Science	The characteristics of an organism are a result of inherited traits received from parent(s).	---	1 point
9	Graphic Response	Life Science	Reproduction is necessary for the continuation of every species.	---	2 points
10	Graphic Response	Life Science	The characteristics of an organism are a result of inherited traits received from parent(s).	---	1 point
11	Multiple Choice	Earth and Space Science	Earth's crust consists of major and minor tectonic plates that move relative to each other.	B	1 point
12	Graphic Response	Earth and Space Science	The composition and properties of Earth's interior are identified by the behavior of seismic waves.	---	1 point

*The Simulation is numbered but not scored.

**Grade 8 Science
EOY Practice Test
Content Summary and Answer Key**

Question No.	Item Type	Content Strand	Content Statement	Answer Key	Points
13	Multi-Select	Life Science	Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species.	C; D; E; F	1 point
14	Graphic Response	Earth and Space Science	The composition and properties of Earth's interior are identified by the behavior of seismic waves.	---	1 point
15	Multiple Choice	Physical Science	Forces have magnitude and direction.	A	1 point
16	Short Answer	Physical Science	There are different types of potential energy.	---	1 point
17	Matching	Earth and Space Science	Evidence of the dynamic changes of Earth's surface through time is found in the geologic record.	---	1 point
18	Multiple Choice	Physical Science	There are different types of potential energy.	A	1 point

**Grade 8
Science
EOY Practice Test**

Question 1

Question and Scoring Guidelines

Question 1

What are the two sources of thermal energy in Earth's interior?

A solar heating and gravity

B combustion and solar heating

C gravity and radioactive decay

D radioactive decay and combustion

Points Possible: 1

See [Alignment](#) for more detail.

Scoring Guidelines

Rationale for Option A: This is incorrect. Earth's interior is not heated directly by the sun although the gravitational contraction of Earth's interior is a source of thermal energy.

Rationale for Option B: This is incorrect. Combustion needs oxygen; there is no free oxygen in Earth's interior and the sun does not directly heat Earth's interior.

Rationale for Option C; Key – As Earth formed, gas and dust particles condensed due to gravitational attraction and, over time, heavier materials contracted into the center of the Earth releasing thermal energy. Also, radioactive elements from Earth's formation decayed, releasing thermal energy. Gravity and radioactive decay continue to be sources of thermal energy in Earth's interior today.

Rationale for Option D: This is incorrect. Combustion needs oxygen and there is no free oxygen in Earth's interior.

Alignment

Content Strand

Earth and Space Science

Content Statement

The composition and properties of Earth's interior are identified by the behavior of seismic waves.

Content Elaboration

The formation of the planet generated heat from gravitational energy and the decay of radioactive elements, which are still present today. Heat released from Earth's core drives convection currents throughout the mantle and the crust.

Cognitive Demand

Recalling Accurate Science (R)

Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform a routine mathematical task. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures and basic principles.

Explanation of the Item

This item requires the student to recall the sources of thermal energy in the Earth's interior. As Earth formed, the heat in Earth's interior was much greater than it is today. The source of that heat came from gravitational contraction of Earth's interior and radioactive decay of radioactive elements in the interior of Earth.

As Earth formed, gas and dust particles condensed due to gravitational attraction and, over time, heavier materials contracted into the center of the Earth releasing thermal energy. Also, radioactive elements from Earth's formation decayed, releasing thermal energy. Gravity and radioactive decay continue to be sources of thermal energy in Earth's interior today.

Sample Response: 1 point

What are the two sources of thermal energy in Earth's interior?

- A solar heating and gravity
- B combustion and solar heating
- C gravity and radioactive decay
- D radioactive decay and combustion

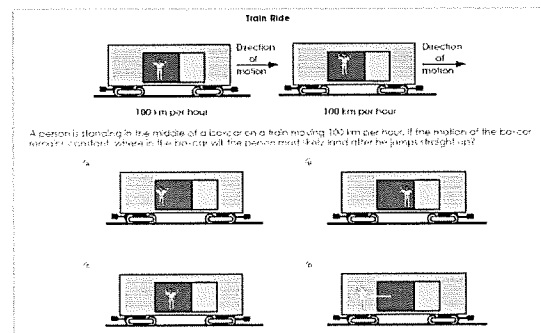
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Grade 8 Science EOY Practice Test

Question 2

Question and Scoring Guidelines

Question 2



Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: This is incorrect. The person is moving at the same speed and in the same direction as the train. Since there are no horizontal forces acting on the person, the person will keep moving with the same speed and in the same direction as the train, even while jumping. The person will land in the same position of the train from where the person jumped, not behind the jumping position. In order to land behind the jumping position, a net force acting in this direction would be required.

Rationale for Option B: This is incorrect. The person is moving at the same speed and in the same direction as the train. Since there are no horizontal forces acting on the person, the person will keep moving with the same speed and in the same direction as the train, even while jumping. The person will land in the same position of the train from where the person jumped, not in front of the jumping position. In order to land in front of the jumping position, a net force acting in this direction would be required.

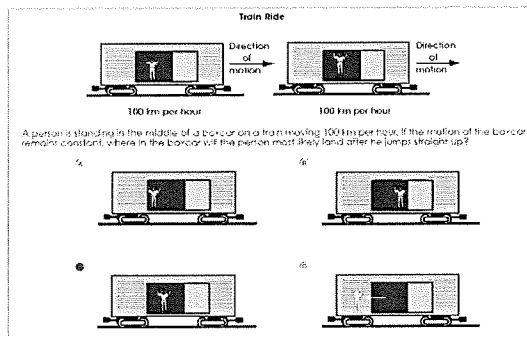
Rationale for Option C: Key – The person is moving at the same speed and in the same direction as the train. Since there are no horizontal forces acting on the person, the person will keep moving with the same speed and in the same direction as the train, even while jumping. The person will land in the same position of the train from where the person jumped, not behind or in front of the jumping position. In order to land in a different position, a net horizontal force would be required.

Rationale for Option D: This is incorrect. The person is moving at the same speed and in the same direction as the train. Since there are no horizontal forces acting on the person, the person will keep moving with the same speed and in the same direction as the train, even while jumping. The person will land in the same position of the train from where the person jumped, not behind the jumping position. In order to land behind the jumping position, a net force acting in this direction would be required.

Explanation of the Item

This item requires applying reasoning to a situation involving a person jumping in a boxcar of a moving train to determine where the person will land. The student must apply knowledge that a moving object will continue moving with the same speed and in the same direction in the absence of an outside net force to the situation. There are no horizontal forces acting on the person and the person is moving with the same speed and in the same direction as the train; therefore, the person will continue to move with the same speed and in the same direction as the train while jumping in the air and landing.

Sample Response: 1 point



Alignment

Content Strand
Physical Science

Content Statement
Forces have magnitude and direction.

Content Elaboration
"When the net force is zero, the object remains at rest or continues to move at a constant speed in a straight line."

"If all forces are balanced by equal forces in the opposite direction, the object will maintain its current motion (both speed and direction). This means if the object is stationary, it will remain stationary. If the object is moving, it will continue moving in the same direction and at the same speed. Such qualitative, intuitive understandings and descriptions of inertia must be developed through inquiry activities."

Cognitive Demand
Interpreting and Communicating Science Concepts (C)

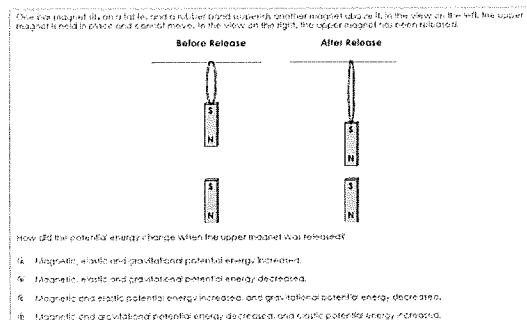
Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

**Grade 8
Science
EOY Practice Test**

Question 3

Question and Scoring Guidelines

Question 3



Points Possible: 1
See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: This is incorrect. It is true the elastic potential energy will increase as the band is stretched; however, opposite poles attract and the magnetic potential energy decreases as attractive poles get closer together. Also, since gravitational force is only an attractive force between masses, gravitational potential energy becomes less as objects get closer to Earth.

Rationale for Option B: This is incorrect. It is true that gravitational potential energy and magnetic potential energy decrease; however, elastic potential energy increases as the rubber band is stretched.

Rationale for Option C: This is incorrect. It is true that the elastic potential energy increases and the gravitational potential energy decreases; however, opposite poles attract and the magnetic potential energy decreases as they get closer together.

Ratio/rate for Option D: Key – Magnetic potential energy decreases. Since the magnets are oriented with the north pole of one magnet closest to the south pole of the second magnet, there is a net attractive force between the magnets as they are positioned in the picture. Since the magnetic force between the magnets is attractive, more energy must be put into the system to separate the attractive poles; therefore, the closer the attractive magnets are, the lower the magnetic potential energy. Likewise, since gravitational force is an attractive force between masses, more energy must be put into the system to separate the masses; therefore, the closer the masses are, the lower the gravitational potential energy. Also, elastic potential energy increases as the rubber band is stretched.

Explanation of the Item

This multiple choice question requires the student to identify how the magnetic, elastic and gravitational potential energy change in a system involving two magnets and a rubber band.

As the system is released, the upper magnet is closer to the ground. Since gravitational potential energy is attractive, the closer the two objects are (in this case the magnet and Earth), the lower the gravitational potential energy. In order to increase the gravitational potential energy, more energy must be transferred into the system to separate the masses that attract one another.

As the system is released, the rubber band is stretched more, increasing the elastic potential energy.

The magnets are positioned so the north pole of one magnet is closest to the south pole of the other magnet. This results in a net attractive force between the magnets. After the system is released, the magnets get closer together. Since the net force between the magnets positioned in this way is attractive, the closer the two objects are, the lower the magnetic potential energy. In order to increase the magnetic potential energy, more energy must be transferred into the system to separate the attractive poles.

If the magnets are positioned differently, where similar poles are closer together (north closer to north or south closer to south), there would be a net repulsive force between the magnets. With a repulsive force between the magnets, the magnetic potential energy would increase as the magnets got closer. This is because more energy must be transferred into the system to bring the repulsive poles closer together.

Alignment

Content Strand

Physical Science

Content Statement

There are different types of potential energy.

Content Elaboration

“Gravitational potential energy changes in a system as the masses or relative positions of objects are changed.”

“Gravitational potential energy is associated with the mass of an object and its height above a reference point (e.g., above ground level, above floor level). A change in the height of an object is evidence that the gravitational potential energy has changed.

Elastic potential energy is associated with how much an elastic object has been stretched or compressed and how difficult such a compression or stretch is. A change in the amount of compression or stretch of an elastic object is evidence that the elastic potential energy has changed.

Magnetic potential energy is associated with the position of magnetic objects relative to each other.”

Cognitive Demand

Recalling Accurate Science (R)

Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform a routine mathematical task. This cognitive demand refers to students’ knowledge of science fact, information, concepts, tools, procedures and basic principles.

Sample Response: 1 point

On a flat magnet sits on a table, and a rubber band supports another magnet above it, in the view on the left. The other magnet is held in place and controlled. In the view on the right, the upper magnet has been released.

How did the potential energy change when the upper magnet was released?

- A. Magnetic, elastic, and gravitational potential energy increased.
- B. Magnetic, elastic, and gravitational potential energy decreased.
- C. Magnetic and elastic potential energy increased, and gravitational potential energy decreased.
- D. Magnetic and gravitational potential energy decreased, and elastic potential energy increased.

Question 4

An engineer is collecting data on four different satellites orbiting Earth. The engineer records the satellites’ distances from Earth in kilometers (km) and their forces due to gravity in Newtons (N).

Satellite	Mass (kg)	Distance (km)	Force due to gravity (N)
1	700	4000	17000
2	700	36000	
3	1000		11000
4	1000	7000	8100

Estimate the values for the two missing quantities. Enter your estimates into the blank boxes in the table.

Points Possible: 1
See Alignment for more detail.

Scoring Guidelines

For this item, a full-credit (1 point) response includes

- Greater than 0 and less than 7000 in the Satellite 3 Distance box
- AND
- Greater than 0 and less than 17000 in the Satellite 2 Force due to gravity box.

**Grade 8
Science
EOY Practice Test**

Question 4

Question and Scoring Guidelines

Alignment

Content Strand

Physical Science

Content Statement

Forces between objects act when the objects are in direct contact or when they are not touching.

Content Elaboration

"Gravitational fields exist around objects with mass. If a second object with mass is placed in the field, the two objects experience attractive gravitational forces toward each other. Gravitational force weakens rapidly with increasing distance.

Every object exerts a gravitational force on every other object with mass. These forces are hard to detect unless at least one of the objects is very massive (e.g., sun, planets). The gravitational force increases with the mass of the objects, decreases rapidly with increasing distance and points toward the center of objects. Weight is gravitational force and is often confused with mass. Weight is proportional to mass, but depends upon the gravitational field at a particular location. An object will have the same mass when it is on the moon as it does on Earth. However, the weight (force of gravity) will be different at these two locations."

Cognitive Demand

Interpreting and Communicating Science Concepts [C]

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

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Explanation of the Item

This table item requires the student to apply reasoning and scientific knowledge to estimate acceptable values for gravitational force and distance into a data table. It must be understood that gravitational force increases with mass and decreases with distance. Since it is not required to know precise mathematical relationships, a wide range of answers is accepted.

To determine the force due to gravity for Satellite 2, one can compare it to Satellite 1, since it has the same mass. Since Satellite 2 has a greater distance from Earth than Satellite 1 but the same mass, it will have a lower force of gravity than 17000 N, the force of gravity of Satellite 1. Since its mass is still attracted to Earth, it cannot have a mass of 0; therefore, any answer greater than 0 N and less than 17000 N is accepted. If Newton's Law of Universal Gravity is used (introduced in High School Physics), the best answer is 2100 N; however, students are not held accountable for the mathematical relationship between distance and force due to gravity at this level of precision. Simply understanding that the force decreases as the distance increases is acceptable for this grade level.

To determine the distance for Satellite 3, one can compare it to Satellite 4, since it has the same mass. Since Satellite 3 has a higher force due to gravity than Satellite 4 but the same mass, it will be at a distance less than 7000 km, the distance of Satellite 4. Any answer greater than 0 km and less than 7000 km is accepted. If Newton's Law of Universal Gravity is used (introduced in High School Physics) the best answer is 6000 N; however, students are not held accountable for the mathematical relationship between distance and force due to gravity at this level of precision. Simply understanding that the force increases as the distance decreases is acceptable for this grade level.

This item is worth one point. In order to receive credit, the student must estimate both values within the acceptable ranges.

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Sample Response: 1 point

An engineer is collecting data on four different satellites orbiting Earth. The engineer records the satellites' distances from Earth in kilometers (km) and their forces due to gravity in Newtons (N).

Satellite	Mass (kg)	Distance (km)	Force due to gravity (N)
1	700	4000	17000
2	700	36000	2100
3	1000	6000	11000
4	1000	7000	8100

Estimate the values for the two missing quantities. Enter your estimates into the blank boxes in the table.

Notes on Scoring

This response earns one point because both estimated values are within the accepted ranges. The force due to gravity for Satellite 2 is predicted to be "2100 N," which is greater than 0 N and less than 17000 N. The distance for Satellite 3 is predicted to be "6000 N," which is greater than 0 km and less than 7000 km.

Grade 8 Science EOY Practice Test

Question 4

Sample Responses

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Sample Responses: 0 points

An engineer is collecting data on four different satellites orbiting Earth. The engineer records the satellites' distances from Earth in kilometers (km) and their forces due to gravity in Newtons (N).

Satellite	Mass (kg)	Distance (km)	Force due to gravity (N)
1	700	4000	17000
2	700	36000	25000
3	1000	9000	11000
4	1000	7000	8100

Estimate the values for the two missing quantities. Enter your estimates into the blank boxes in the table.

Notes on Scoring

This response earns zero points because neither estimated value is within the accepted range. The force due to gravity for Satellite 2 is predicted to be "25000 N," which is greater, not less than 17000 N. The distance for Satellite 3 is predicted to be "9000 N," which is greater, not less than 7000 km.

An engineer is collecting data on four different satellites orbiting Earth. The engineer records the satellites' distances from Earth in kilometers (km) and their forces due to gravity in Newtons (N).

Satellite	Mass (kg)	Distance (km)	Force due to gravity (N)
1	700	4000	17000
2	700	36000	24000
3	1000	6000	11000
4	1000	7000	8100

Estimate the values for the two missing quantities. Enter your estimates into the blank boxes in the table.

Notes on Scoring

This response earns zero points because both estimated values must be within the accepted ranges in order to earn credit. The distance for Satellite 3 is predicted to be "6000 N," which is greater than 0 km and less than 7000 km; however, the force due to gravity for Satellite 2 is predicted to be "24000 N," which is greater, not less than 17000 N.

Grade 8
Science
EOY Practice Test

Question 5

Question and Scoring Guidelines

Question 5

Which term is an example of force?

- A energy
- B mass
- C weight
- D work

Points Possible: 1
See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: This is incorrect. Force is an attraction or repulsion between two objects. Energy can be transferred from one object to another through forces, but energy is not a force.

Rationale for Option B: This is incorrect. Mass can be thought of as the amount of matter in an object. Force is an attraction or repulsion between two objects.

Rationale for Option C: Key – Weight is another term for the gravitational force between two objects with mass.

Rationale for Option D: This is incorrect. Work is a method by which energy can be transferred by a force being exerted on two objects as they move over a distance. Force is an attraction or repulsion between two objects.

Alignment

Content Strand

Physical Science

Content Statement

Forces between objects act when the objects are in direct contact or when they are not touching.

Content Elaboration

Every object exerts a gravitational force on every other object with mass. These forces are hard to detect unless at least one of the objects is very massive (e.g., sun, planets). The gravitational force increases with the mass of the objects, decreases rapidly with increasing distance and points toward the center of objects. Weight is gravitational force and is often confused with mass. Weight is proportional to mass, but depends upon the gravitational field at a particular location. An object will have the same mass when it is on the moon as it does on Earth; however, the weight (force of gravity) will be different at these two locations.

Cognitive Demand

Recalling Accurate Science (R)

Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform a routine mathematical task. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures and basic principles.

Explanation of the Item

This multiple choice item requires students to identify that weight is an example of force. Force is an attraction or repulsion between two objects. Weight is a measure of the gravitational attraction between two objects.

Sample Response: 1 point

Which term is an example of force?

A energy

B mass

C weight

D work

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Grade 8 Science EOY Practice Test

Question 6

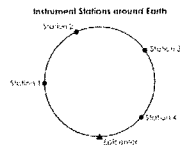
Question and Scoring Guidelines

Question 6

The following question is based on the fact presented in Part A. Then answer part B.

Part A

In the event of a great earthquake, seismic waves ripple out from the epicenter of the earthquake and are recorded at four seismometer stations around Earth as shown.



Which station will receive fewer waves than the others?

A Station 1 and 4

B Station 2 and 3

C Station 1 and 4

D Station 1 and 2

Part B

Select the **two** statements that are most likely to be true about the waves.

1 Part of Earth's interior bent some of the waves.

2 Differences in Earth's interior bent some of the waves.

3 Some waves are blocked by water on the Earth's surface.

4 All waves travel at the same speed through Earth's interior.

Points Possible: 1

See [Alignment](#) for more detail.

Scoring Guidelines

Part A

Rationale for Option A: This is incorrect. Station 1 and station 4 are closest to the epicenter of the earthquake and therefore are in locations that will pick up all of the waves. When seismic waves pass through different types of materials their speed is altered; consequently, their path through the materials may be bent. This is called "refraction."

Rationale for Option B; Key – Stations 2 and 3 are farthest away from the epicenter of the earthquake and therefore are in positions where some, if not all, of the waves will not reach. Some waves will be reflected away from and some will be refracted away from the stations due to the composition of Earth's interior.

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When seismic waves hit a surface between very different materials they may bounce off; this is called "reflection." In the Earth, seismic waves reflect at the boundaries between the major earth layers.

Rationale for Option C: This is incorrect. Station 4 is in a location that will pick up all of the waves.

Rationale for Option D: This is incorrect. Station 1 is in a location that will pick up all of the waves.

Part B

First Rationale; Key – Some of the stations will either receive only one type of wave or none of the waves due to the waves being reflected or refracted away from their positions.

Second Rationale; Key – Some of the stations will either receive only one type of wave or none of the waves due to the waves being reflected or refracted away from their positions.

Third Rationale: This is incorrect. Seismic waves travel through Earth's crust and are recorded from their terminal point on the solid crust. Some waves are able to travel through water but do not need to in order to reach the recording stations.

Fourth Rationale: This is incorrect. Weather events occur above Earth's crust and cannot prevent waves from reaching recording stations.

Alignment

Content Strand

Earth and Space Science

Content Statement

The composition and properties of Earth's interior are identified by the behavior of seismic waves.

The refraction and reflection of seismic waves as they move through one type of material to another is used to differentiate the layers of Earth's interior. Earth has an inner and outer core, an upper and lower mantle, and a crust.

Content Elaboration

It is important to provide the background knowledge regarding how scientists know about the structure and composition of the interior of Earth (without being able to see it). Seismic data, graphics, charts, digital displays and cross sections must be used to study Earth's interior. Actual data from the refraction and reflection of seismic waves can be used to demonstrate how scientists have determined the different layers of Earth's interior. New discoveries and technological advances relating to understanding Earth's interior also play an important role in this content.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

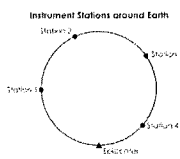
This item requires interpreting a real world earthquake scenario and seismic wave activity. The student is required to identify the two stations that will record the fewest seismic waves and explain why this occurs. When an Earthquake occurs seismic waves are emitted from the epicenter. From the epicenter there are several paths the waves can take through the earth before emerging again at the surface. The speed of seismic waves depends on variations in strength and density of the material that they pass through. When seismic waves hit a surface between very different materials they may bounce off; this is called "reflection." In the Earth, seismic waves reflect at the boundaries between the major earth layers. When seismic waves pass through different types of materials their speed is altered and consequently their path through the materials may be bent, which is called "refraction."

Sample Response: 1 point

The following question has two parts. Part A asks you to select two stations. Part B asks you to select two statements that explain why fewer waves were recorded at some stations.

Part A

On the chart, circles around Earth record seismic waves from the epicenter. One station is located at the epicenter of the earthquake and the location of four other stations are shown.



Which stations will record fewer waves from the epicenter?

Station 1 and 4
 Station 2 and 3
 Station 3 and 4
 Station 1 and 2

Part B

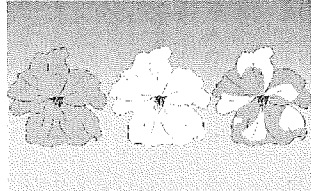
Select the **two** statements that explain why fewer waves were recorded at some stations.

Part of part 1's intended scope of the waves.
 Different material in Earth's reflected some of the waves.
 Some waves are blocked by water on the Earth's surface.
 Weather events near the stations can prevent waves from being recorded.

Question 7 (Simulation for Question 8)

A farmer grows flowering bushes. The bushes have red, white, or red and white flowers.

Select two parents to cross and then click Start. The number of offspring with each flower color will be shown.



Parent 1: Red Flowers

Parent 2: Red Flowers

Start

Change Offspring

Parent 1	Parent 2	Red Flowers	White flowers	Red and White flowers

**Grade 8
Science
EOY Practice Test**

Question 7

Simulation for Question 8

**Grade 8
Science
EOY Practice Test**

Question 8

Question and Scoring Guidelines

Question 8

The table below is for a simulation that allows you to determine the flower color genotype for each flowering plant parent.

Use the information in the table below to show the genotype for each parent.

- Place only one letter in each box.
- Use uppercase letters to make flowers red.
- Use lowercase letters to make flowers white.

Genotype of Body Cells	
Parent	Genotype
Red Flower	
White Flower	
Red and White Flower	

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

For this item, a full-credit response includes

- Only "R" "R" in the Red Flowers boxes
- AND
- Only "W" "W" in the White Flowers boxes
- AND
- Only "R" "W" in the Red and White Flowers boxes (1 point).

Note: The two alleles placed in each cell of the table can be placed in the same dashed box and in any order and credit will still be awarded.

Alignment

Content Strand
Life Science

Content Statement

The characteristics of an organism are a result of inherited traits received from parent(s).

Content Elaboration

The traits of one or two parents are passed on to the next generation through reproduction. Traits are determined by instructions encoded in deoxyribonucleic acid (DNA), which forms genes. Genes have different forms called alleles. The concepts of dominant and recessive genes are appropriate at this grade level. Co-dominant traits such as roan color in horses and cows may be useful to provide further validation of the theory and to help dispel some misconceptions.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

This item requires determining the flower color genotype for each flowering plant parent. The item also requires application of the concept that the traits of one or two parents are passed on to the next generation through reproduction and that these traits are determined by instructions encoded in deoxyribonucleic acid (DNA), which forms genes. Genes have different forms called alleles. It should be understood that a genotype is the representation of alleles shown as either uppercase (dominant) or lowercase (recessive) letters.

In this item, students will interpret the results of the simulation and determine that when both co-dominant alleles are present, both allele traits are expressed in the organism. The co-dominance pattern differs from a simple dominance pattern; the dominant (uppercase) allele will always be expressed and the recessive (lowercase) trait will only be expressed if both alleles are recessive. Using the simulation to cross parents of different flower color variations and interpreting the patterns of traits in the offspring, the student can determine the genotype for each flowering plant parent.

Grade 8 Science EOY Practice Test

Question 8

Sample Responses

Sample Responses: 1 point

Use the structure to perform an investigation to determine the flower color genotype for each flowering bush parent.

Frame the alleles in the parent flowers to determine the genotype for each parent.

- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.

Parent	Genotype
Red Flower	RR
White Flower	WW
Red and White Flower	RW

Use the structure to perform an investigation to determine the flower color genotype for each flowering bush parent.

Frame the alleles in the parent flowers to determine the genotype for each parent.

- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.

Parent	Genotype
Red Flower	RR
White Flower	WW
Red and White Flower	RW

Notes on Scoring

These responses correctly identify that all the alleles are dominant through the use of all uppercase letters in the genotypes. The response correctly shows that the red flowers must have two dominant alleles, "R," to express the red color. The response correctly shows that the white flowers must have two dominant alleles, "W," to express the white color. The response correctly shows that the plant with both red- and white-colored flowers must have one of each of the dominant alleles "R" and "W" to express both of these colors. The genotype for red and white flowers can be written as either "RW" or "WR."

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Sample Response: 0 points

Use the structure to perform an investigation to determine the flower color genotype for each flowering bush parent.

Frame the alleles in the parent flowers to determine the genotype for each parent.

- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.

Parent	Genotype
Red Flower	RR
White Flower	WW
Red and White Flower	RR

Notes on Scoring

This response correctly identifies that all the alleles are dominant through the use of all uppercase letters in the genotypes and correctly shows that the plant with both red and white flowers must have one of each of the dominant alleles "R" and "W" to express both of these colors; however, the response incorrectly shows that the red flowers are represented by two dominant "W" alleles and the white flowers represented by two dominant "R" alleles. This shows a lack of understanding as to which trait the alleles represent.

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Sample Response: 0 points

Use the structure to perform an investigation to determine the flower color genotype for each flowering bush parent.

Frame the alleles in the parent flowers to determine the genotype for each parent.

- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.
- Flower color is controlled by a single gene.

Parent	Genotype
Red Flower	Rr
White Flower	Ww
Red and White Flower	Rr

Notes on Scoring

This response incorrectly identifies the alleles of the red flowers as having one dominant allele ("R") and one recessive allele ("r") and the white flowers of having one dominant allele ("W") and one recessive allele ("w"). This shows a lack of understanding of the concept of simple dominance pattern versus co-dominance patterns. This response does correctly show that the plant with both red and white flowers must have one of each of the dominant alleles "R" and "W" to express both of these colors.

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**Grade 8
Science
EOY Practice Test**

Question 9

Question and Scoring Guidelines

Question 9

A. In the table, provide the correct number of cells and bring the appropriate genetic information that would result from the process of mitosis for a plant with red and white flowers.

B. In the table, provide the correct number of cells containing the appropriate genetic information that would result from the process of meiosis for a plant with red and white flowers.

- Normally, use more than one chromosome.
- Assume a cell size of 100 micrometers.

Red-white Flowering Plant

A. Mitosis	B. Meiosis

Points Possible: 2

See [Alignment](#) for more detail.

Scoring Guidelines

For this item, a full-credit response includes

- Placing of 2 cells total, each containing a red and a white chromosome in the "A" region labeled Mitosis (1 point)
- AND
- Placing of 4 cells total, 2 containing a single red chromosome and 2 containing a single white chromosome in the "B" region labeled Meiosis (1 point).

Alignment

Content Strand
Life Science

Content Statement
Reproduction is necessary for the continuation of every species.

Content Elaboration
Most organisms reproduce either sexually or asexually. Some organisms are capable of both. In asexual reproduction, all genes come from a single parent, which usually means the offspring are genetically identical to their parent, allowing genetic continuity. The end products of mitotic and meiotic cell divisions are compared as they relate to asexual and sexual reproduction.

Cognitive Demand
Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item
This item requires comparing the processes of mitosis and meiosis in a flowering plant by correctly identifying the number of cells produced and amount of genetic information in the resulting cells in each process. This requires the student to interpret the diagrams to communicate that in the process of mitosis the cell copies its genetic material and undergoes one cell division to produce two genetically identical cells.

In the process of mitosis, the parent cell copies its genetic material and undergoes one cell division to produce two genetically identical cells.

Meiosis begins with one cell containing two copies of each chromosome, one from the organism's mother and one from its father. The cell divides twice, producing four cells containing one copy of each chromosome. Each of the resulting chromosomes in the cells is a unique mixture of maternal and paternal DNA.

Grade 8 Science EOY Practice Test

Question 9

Sample Responses

Sample Responses: 2 points

4. In the table, give the correct number of cells containing the genetic material from the original cell for the process of mitosis for a plant cell. Write your answer in the table.

5. In the table, give the correct number of cells containing the genetic material from the original cell for the process of meiosis for a plant cell. Write your answer in the table.

- You may use some of the cells more than once.
- You may not use any of the cells.

4. In the table, give the correct number of cells containing the genetic material from the original cell for the process of mitosis for a plant cell. Write your answer in the table.

5. In the table, give the correct number of cells containing the genetic material from the original cell for the process of meiosis for a plant cell. Write your answer in the table.

- You may use some of the cells more than once.
- You may not use any of the cells.

Notes on Scoring

These responses correctly show that cells undergoing mitosis divide once and result in a total of 2 cells. Each of these cells contain identical genetic material shown in the diagram as a red and white chromosome. These responses correctly show that meiosis results in a total of 4 cells, 2 containing a single red chromosome and 2 containing a single white chromosome. These responses show a correct understanding of the different results of the mitosis and meiosis processes.

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Sample Response: 1 point

4. In the table, give the correct number of cells containing the genetic material from the original cell for the process of mitosis for a plant cell. Write your answer in the table.

5. In the table, give the correct number of cells containing the genetic material from the original cell for the process of meiosis for a plant cell. Write your answer in the table.

- You may use some of the cells more than once.
- You may not use any of the cells.

Notes on Scoring

This response correctly shows that mitosis results in a total of 2 cells; however, it incorrectly shows that one of the cells has 2 red-colored chromosomes and one of the cells has 2 white chromosomes. At the end of mitosis, the cells should be identical, with each containing a single red and a single white chromosome. This response correctly shows that meiosis results in a total of 4 cells, each with half of the genetic material.

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Sample Response: 1 point

4. In the table, give the correct number of cells containing the genetic material from the original cell for the process of mitosis for a plant cell. Write your answer in the table.

5. In the table, give the correct number of cells containing the genetic material from the original cell for the process of meiosis for a plant cell. Write your answer in the table.

- You may use some of the cells more than once.
- You may not use any of the cells.

Notes on Scoring

This response correctly shows that meiosis results in a total of 4 cells; however, it incorrectly shows each cell with two of each chromosome type. In meiosis, the four resulting cells have one-half of the genetic material of the parent cell. This response correctly shows that cells undergoing mitosis divide once and result in a total of 2 cells containing identical genetic material.

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Sample Response: 0 points

A. In the table, place the correct number of cells containing the appropriate genetic information that would result from the process of mitosis for a cell with the genotype RRww.

B. In the table, place the correct number of cells containing the appropriate genetic information that would result from the process of meiosis for a cell with the genotype RRww.

• You may use some of the allele palette objects.
• You may not use the same allele palette object more than once.

Red-white Flowering Plant

	A. Mitosis	B. Meiosis
1		
2		
3		
4		

Notes on Scoring

This response is incorrect for both the mitosis and meiosis columns. This response incorrectly shows 4 cells produced in mitosis, each with one type of chromosome. This response incorrectly shows only 2 cells produced in meiosis, with each cell containing both a single red and white chromosome.

Sample Response: 0 points

A. In the table, place the correct number of cells containing the appropriate genetic information that would result from the process of mitosis for a cell with the genotype RRww.

B. In the table, place the correct number of cells containing the appropriate genetic information that would result from the process of the cell with the genotype RRww.

• You may use some of the allele palette objects.
• You may not use the same allele palette object more than once.

Red-white Flowering Plant

	A. Mitosis	B. Meiosis
1		
2		

Notes on Scoring

This response is incorrect for both the mitosis and meiosis columns. This response incorrectly shows 2 cells produced in mitosis, each with two of the same chromosomes. This response incorrectly shows only 1 cell produced in meiosis.

Grade 8
Science
EOY Practice Test

Question 10

Question and Scoring Guidelines

Question 10

Use the Punnett square created by a student to answer the question about the flowering plant.

These two alleles are the basic alleles for the flower color gene for this cross.

- **R** allele codes for red flower color.
- **r** allele codes for white flower color.
- **W** allele codes for white flower color.
- **w** allele codes for white flower color.
- You do not have to use all the alleles.

R	
r	
W	
w	

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

For this item, a full-credit response includes

- "R" in three out of four of the boxes on the outside of the Punnett square (i.e., the "parent" boxes) and "W" in the remaining box on the outside of the Punnett square
- AND
- Each cell of the Punnett square contains two alleles filled in according to the placement of the alleles in the four boxes on the outside of the Punnett square
- AND
- Only one allele palette object in each of the boxes on the outside of the Punnett square AND only two allele palette objects in each cell of the Punnett square (1 point).

Note: The two alleles placed in one of the cells of the Punnett square can be placed in the same dashed box and credit will still be awarded. The order the two correct alleles are placed in one of the cells of the Punnett square does not affect the scoring of the item.

Alignment

Content Strand

Life Science

Content Statement

The characteristics of an organism are a result of inherited traits received from parent(s).

Content Elaboration

The traits of one or two parents are passed on to the next generation through reproduction. Traits are determined by instructions encoded in deoxyribonucleic acid (DNA), which forms genes. Genes have different forms called alleles. The concepts of dominant and recessive genes are appropriate at this grade level. Co-dominant traits such as roan color in horses and cows may be useful to provide further validation of the theory and to help dispel some misconceptions.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

This item requires the application of conceptual knowledge of genotypes and phenotypes to identify the genotypes of the parents given their phenotype. The student then needs to correctly set up and complete a Punnett square crossing a red flowering plant with a red and white flowering plant and interpret the results. Genes have different forms called alleles. It should be understood that a genotype is the representation of alleles shown as either uppercase (dominant) or lowercase (recessive) letters. In this item, students need to recognize that when both co-dominant alleles ("RW") are present, both traits are expressed in the organism. The co-dominance pattern differs from a simple dominance pattern; the dominant (uppercase) allele will always be expressed and the recessive (lowercase) trait will only be expressed if both alleles are recessive.

Using the simulation to cross parents of different flower color variations and interpreting the patterns of traits in the offspring, the student can determine the genotype for each flowering plant parent. For this cross, the phenotypes of the parents are given as a red flowering bush and a red and white flowering bush. For the red and white flower parent, since both traits are expressed, the genotype is "RW" and should be placed on either the top or left side outside of the Punnett square. The phenotype of the other parent is a red flowering bush. Following the co-dominance pattern, the genotype of this parent is "RR" and should be placed on either the top or left side; outside of the Punnett square.

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Grade 8 Science EOY Practice Test

Question 10

Sample Responses

Sample Responses: 1 point

Use the simulation to cross parents of different flower color variations and interpreting the patterns of traits in the offspring, the student can determine the genotype for each flowering plant parent.

For this cross, the phenotypes of the parents are given as a red flowering bush and a red and white flowering bush. For the red and white flower parent, since both traits are expressed, the genotype is "RW" and should be placed on either the top or left side outside of the Punnett square. The phenotype of the other parent is a red flowering bush. Following the co-dominance pattern, the genotype of this parent is "RR" and should be placed on either the top or left side; outside of the Punnett square.

- Identify the genotype for each parent.
- Complete the Punnett square for the cross.
- Determine the resulting offspring genotypes and phenotypes.

Use the simulation to cross parents of different flower color variations and interpreting the patterns of traits in the offspring, the student can determine the genotype for each flowering plant parent.

For this cross, the phenotypes of the parents are given as a red flowering bush and a red and white flowering bush. For the red and white flower parent, since both traits are expressed, the genotype is "RW" and should be placed on either the top or left side outside of the Punnett square. The phenotype of the other parent is a red flowering bush. Following the co-dominance pattern, the genotype of this parent is "RR" and should be placed on either the top or left side; outside of the Punnett square.

- Identify the genotype for each parent.
- Complete the Punnett square for the cross.
- Determine the resulting offspring genotypes and phenotypes.

Notes on Scoring

These responses correctly identify the parent genotypes as "RR" (red-flowered) and "RW" (red- and white-flowered). Each parental genotype can be placed either on the top or the left side of the Punnett square without affecting the results of the Punnett square cross. Both responses show a correctly completed Punnett square with half of the resulting offspring inheriting two "RR" (red) alleles, one from each parent. The other half of offspring are correctly shown as inheriting one "R" (red) allele from one parent and one "W" (white) allele from the other parent.

Sample Response: 0 points

Use the Punnett square to cross the red-flowered parent and the white-flowered parent.

Place the alleles for the trait from the red-flowered parent in the top row.

- For each allele, place the alleles for the trait from the white-flowered parent in the left column.
- Place the alleles for the trait from the white-flowered parent in the left column.
- Place the alleles for the trait from the red-flowered parent in the top row.
- Place the alleles for the trait from the white-flowered parent in the left column.

Notes on Scoring

This response correctly identifies the genotype of the red-flowered parent ("RR") but incorrectly identifies the parental genotype of the red- and white-flowered parent as "WW" instead of "RW". This response does not indicate that a parental plant exhibiting both red and white color traits must have one of each allele for these traits. Due to the use of an incorrect genotype for one of the parents, the resulting Punnett square incorrectly shows all offspring as "RW" (red and white flowering plant).

Sample Response: 0 points

Use the Punnett square to cross the red-flowered parent and the white-flowered parent.

Place the alleles for the trait from the red-flowered parent in the top row.

- For each allele, place the alleles for the trait from the white-flowered parent in the left column.
- Place the alleles for the trait from the white-flowered parent in the left column.
- Place the alleles for the trait from the red-flowered parent in the top row.
- Place the alleles for the trait from the white-flowered parent in the left column.

Notes on Scoring

This response incorrectly identifies the genotypes of both parents. The response incorrectly identifies the genotype of the red flower parent as having one dominant allele ("R") and one recessive allele ("r") instead of two dominant alleles for the red color trait "RR." The response incorrectly identifies the parental genotype of the red and white flowered plant as "Ww" instead of "RW." This response does not indicate that a parental plant exhibiting both red and white color traits must have one of each allele for these traits. Due to the use of incorrect genotypes of both parents, the resulting Punnett square is completed incorrectly.

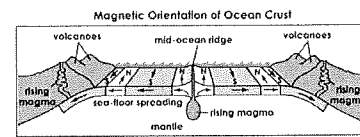
Grade 8
Science
EOY Practice Test

Question 11

Question and Scoring Guidelines

Question 11

As magma rises from the mid-ocean ridge, it cools and solidifies. As this magma solidifies, some of the minerals in it align with Earth's magnetic field. Every few million years, Earth's magnetic field reverses. Its reversal is recorded in the magma that solidified after leaving the mid-ocean ridge. In the picture, these magnetic reversals are indicated by dark and light bands.



Courtesy of Kenneth R. Long, The Cambridge Guide to the Solar System, Second Edition, 2011.

How can scientists tell when the reversal of the magnetic field occurred?

- A by measuring the thickness of the different bands of the oceanic crust
- B by measuring the distance between the mid-ocean ridge and the ocean floor band
- C by measuring the amounts of minerals that aligned to Earth's magnetic field in the different bands
- D by measuring the strength of Earth's magnetic field recorded in the solidified magma of the oceanic crust

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: This is incorrect. Magnetic field reversal is not related to crust thickness.

Rationale for Option B: Key – By measuring the distance of the band boundary from the mid-ocean ridge and using the rate of sea floor spreading, the times of the magnetic reversals can be determined.

Rationale for Option C: This is incorrect. The amounts of minerals that aligned to Earth's magnetic field will not impart any information as to the timing of the reversals.

Rationale for Option D: This is incorrect. It is the direction, not the strength of the magnetic field that is the relevant property.

Alignment

Content Strand

Earth and Space Science

Content Statement

Earth's crust consists of major and minor tectonic plates that move relative to each other.

Content Elaboration

Historical data and observations such as fossil distribution, paleomagnetism, continental drift and sea-floor spreading contributed to the theory of plate tectonics. The rigid tectonic plates move with the molten rock and magma beneath them in the upper mantle.

The historical data related to the present plate tectonic theory must include continental "puzzle-like-fit" noticed as early as Magellan and by other mapmakers and explorers, paleontological data, paleoclimate data, paleomagnetic data, continental drift (Wegener), convection theory (Holmes) and sea floor spreading (Hess, Deitz). Contemporary data must be introduced, including seismic data, GPS/GIS data (documenting plate movement and rates of movement), robotic studies of the sea floor and further exploration of Earth's interior.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

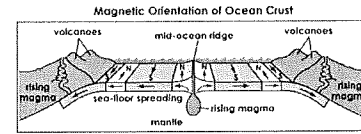
Explanation of the Item

This item requires the student to interpret a diagram showing bands of oceanic crust with different magnetic orientations near a mid-ocean ridge to determine how to estimate when the magnetic field reversals occurred. As the sea floor is formed, magma rises from the mid-ocean ridge, forming new rock, and pushes the older rock away from the center, forming symmetrical bands on either side of the ridge. Every few million years, the magnetic field reverses in these bands. By measuring the distance of the band boundary from the mid-ocean ridge and using the rate of sea floor spreading, scientists can determine when the reversals of the magnetic field occurred.

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Sample Response: 1 point

As magma rises from the mid-ocean ridge, it cools and solidifies. As this magma solidifies, some of the minerals align with Earth's magnetic field. Every few million years, Earth's magnetic field reverses. This reversal is recorded in the magma that solidified after leaving the mid-ocean ridge. In this picture, these magnetic reversals are indicated by dark and light bands.



How can scientists tell when the reversals of the magnetic field occurred?

- 4. by measuring the thickness of the different bands of the oceanic crust
- 1. by measuring the distance between the mid-ocean ridge and the ocean floor band
- 2. by measuring the amount of minerals that aligned to Earth's magnetic field in the different bands
- 3. by measuring the strength of Earth's magnetic field recorded in the solidified magma of the oceanic crust

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Grade 8 Science EOY Practice Test

Question 12

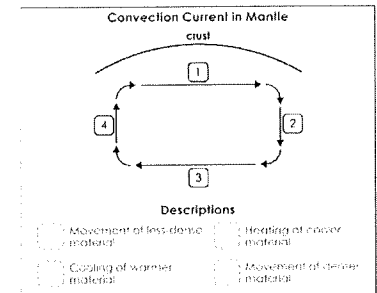
Question and Scoring Guidelines

Question 12

The diagram represents a convection current in Earth's mantle.

Descriptions of the events at each of the positions are shown.

Above each number from the diagram is the blank box that describes the event occurring at that position in the convection current.



Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

For this item, a full-credit response includes

- "4" in the top left box
AND
- "1" in the bottom left box
AND
- "3" in the top right box
AND
- "2" in the bottom right box (1 point).

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Alignment

Content Strand

Earth and Space Science

Content Statement

The composition and properties of Earth's interior are identified by the behavior of seismic waves.

Content Elaboration

Earth and other planets in the solar system formed as heavier elements coalesced in their centers. Planetary differentiation is a process in which more dense materials of a planet sink to the center, while less dense materials stay on the surface. A major period of planetary differentiation occurred approximately 4.6 billion years ago (College Board Standards for College Success, 2009).

The formation of the planet generated heat from gravitational energy and the decay of radioactive elements, which are still present today. Heat released from Earth's core drives convection currents throughout the mantle and the crust.

In addition to the composition of Earth's interior, the history of the formation of Earth and the relationship of energy transfer, transformation and convection currents within the mantle and crust are essential in understanding sources of energy.

Cognitive Demand

Recalling Accurate Science (R)

Requires students to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform a routine mathematical task. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures and basic principles.

Explanation of the Item

This item requires recalling the role of heat and convection currents in energy and matter transfer within the mantle in relation to the position on the diagram.

This item requires recalling how heat generated from gravitational energy and the decay of radioactive elements drives convection currents throughout the mantle. The student must also recall the process of planetary differentiation in which more dense materials of a planet sink to the interior of Earth, while less dense materials rise closer to the surface.

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Grade 8 Science EOY Practice Test

Question 12

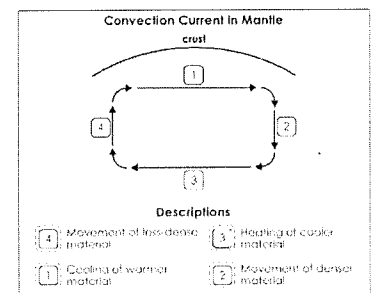
Sample Responses

Sample Response: 1 point

The diagram represents a convection current in Earth's mantle.

Descriptions of the events at each of the positions are shown.

Move each number from the diagram to the blank box that describes the event occurring at that position in the convection current.



Notes on Scoring

This response correctly matches the descriptions with their positions on the diagram. Position 1 is correctly described as material cooling as it moves closer to the crust. Position 2 is correctly described as denser material sinking over time and moving further down in the mantle. Position 3 is correctly described as heating of cooler material as it is further down in the mantle closer to the hot core of the earth. Position 4 is correctly described as movement of less dense material slowly rising in the mantle until it again reaches position 1 and the cycle continues.

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Sample Response: 0 points

The diagram represents a convection current in Earth's mantle.

Descriptions of the events at each of the positions are shown.

Move each number from the diagram to the blank box that describes the event occurring at that position in the convection current.

Convection Current in Mantle and crust

Descriptions

- 1. Movement of less dense material
- 2. Heating of denser material
- 3. Cooling of warmer material
- 4. Movement of denser material

Notes on Scoring

This response incorrectly matches the descriptions with the diagram position labels 3 and 4.

Sample Response: 0 points

The diagram represents a convection current in Earth's mantle.

Descriptions of the events at each of the positions are shown.

Move each number from the diagram to the blank box that describes the event occurring at that position in the convection current.

Convection Current in Mantle and crust

Descriptions

- 1. Movement of less dense material
- 2. Heating of denser material
- 3. Cooling of warmer material
- 4. Movement of denser material

Notes on Scoring

This response incorrectly matches the descriptions with diagram position labels.

Grade 8
Science
EOY Practice Test

Question 13

Question and Scoring Guidelines

Question 13

An environmental change occurs, causing a change in the color of the plants in an ecosystem. The graph shows the color distribution in a snail population at two different times.

Color Distribution in a Snail Population

Legend:

- Population before change
- Population after change

Select the four possible explanations for the results shown in the graph.

- The light-colored snails ate the plants.
- Snails with darker coloration felt the ecosystem.
- Predators could see the easily eaten light-colored snails.
- The light-colored snails had fewer offspring to pass the trait on to.
- The span of a generation was an outlier from the original population.
- Snails with the lighter coloration moved into another ecosystem to survive.

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

First Rationale: This is incorrect. The number of lighter-colored snails has decreased but there are still some lighter-colored snails in the ecosystem.

Second Rationale: This is incorrect. There are a higher number of darker-colored snails in the changed ecosystem than the original population.

Third Rationale: Key – The results of the graph support that light-colored snails are less suited to their environment. It is possible that the environmental change made the lighter-colored snails easier to see, making them more likely to be preyed upon by predators; thus, reducing the number of lighter-colored snails.

Fourth Rationale; Key – Lighter-colored snails did not survive to reproduce to pass the trait for lighter color on to their offspring.

Fifth Rationale; Key – Based on the graph of the original population, darker coloration was an existing trait in the snail population.

Sixth Rationale; Key – Lighter-colored snails may have migrated out of the ecosystem due to the environmental change in order to survive.

Alignment

Content Strand
Life Science

Content Statement

Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species.

Content Elaboration

Diversity can result from sexual reproduction. The sorting and combination of genes results in different genetic combinations that allow offspring to be similar to, yet different from, their parents and each other. (This statement must be connected to the grade 8 Life Science content statement on reproduction and Mendelian Genetics.) These variations may allow for survival of individuals when the environment changes. Diversity in a species increases the likelihood that some individuals will have characteristics suitable to survive under changed conditions.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

This item requires interpreting graphical data of color distribution in a snail population and explaining the results of the data. This requires the student to interpret how changes in environmental conditions can affect how beneficial the color trait will be for the survival and reproductive success of a snail population. The graph shows that trait for color is present in various shades from lighter to darker.

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In the original population the number of individual snails in the population that are very light or very dark is small, while the number of snails with medium coloration is highest. This indicates that snails with medium coloration in the original population are best suited to their environment and are most likely to survive and pass this coloration trait on to their offspring. After an environmental change occurs, there are fewer snails of light or medium coloration and a higher number of snails with darker coloration. This indicates that the darker coloration is best suited to this new environment and that darker snails are more likely to survive and pass this coloration trait on to their offspring.

Sample Response: 1 point

An environmental change occurs, causing a change in the color of snails present in an ecosystem. The graph shows the color distribution in a snail population at two different times.

Select the four possible explanations for the results shown in the graph.

- The lighter coloration trait is an attractor.
- Snails with darker coloration left the ecosystem.
- The population had more dark snails before the change occurred.
- The population changed snail heads by eating to pass the trait along.
- The darker coloration was an existing trait in the original population.
- Snails with the lighter coloration moved to a different ecosystem to survive.

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Grade 8 Science EOY Practice Test

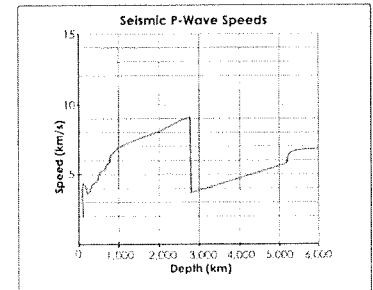
Question 14

Question and Scoring Guidelines

Question 14

The graph shows the behavior of primary waves during an earthquake.

Click on each region of the graph where seismic waves entered different layers of Earth's interior.



Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

For this item, a full-credit response includes

- The region at 2,800 km selected
- AND
- the region at 5,300 km selected (1 point).

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Alignment

Content Strand

Earth and Space Science

Content Statement

The composition and properties of Earth's interior are identified by the behavior of seismic waves.

Content Elaboration

The refraction and reflection of seismic waves as they move through one type of material to another is used to differentiate the layers of Earth's interior. Earth has an inner and outer core, an upper and lower mantle, and a crust.

Seismic data, graphics, charts, digital displays and cross sections must be used to study Earth's interior. Actual data from the refraction and reflection of seismic waves can be used to demonstrate how scientists have determined the different layers of Earth's interior. New discoveries and technological advances relating to understanding Earth's interior also play an important role in this content.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

This item requires interpreting data of the speed of seismic waves at increasing depths inside Earth during an earthquake. The students will use their knowledge of the composition of the layers of Earth to interpret seismic wave data at different depths. As the waves travel through the crust to the mantle, the speed increases. P-waves are compressional waves that travel through different materials at different speeds. They travel slowest in air, faster in water and fastest in solids. As the P-waves move through the Earth's interior (crust, mantle, inner and outer core), their speed changes.

The speed of seismic waves depends on variations in strength and density of the material that they pass through. The speed increases from the crust to the mantle. The speed of the waves decreases sharply as they travel from the mantle to the hotter more liquid outer core. The speed of the waves spikes slightly at 5,300 km as the waves travel from the outer to the inner core.

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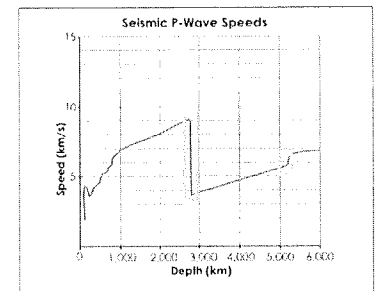
Grade 8 Science EOY Practice Test

Question 14

Sample Responses

Sample Response: 1 point

The graph shows the behavior of primary waves during an earthquake. Click on each region of the graph where seismic waves entered different layers of Earth's interior.

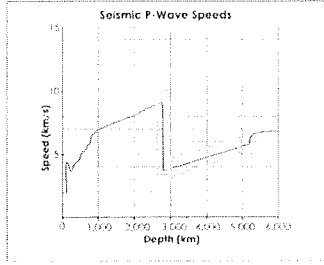


Notes on Scoring

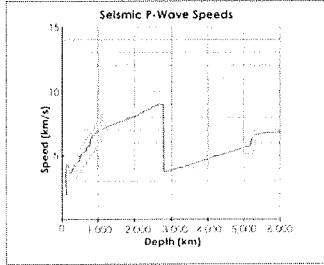
This response correctly identifies the depth regions on the graph at 2,800 km and 5,300 km as regions in which seismic waves entered the different layers of Earth. The first region (2,800 km) shows the speed of the waves decreasing sharply as they travel from the mantle to the hotter, more liquid outer core. The speed gradually increases as the waves travel through the outer core as the temperatures increase with depth. The speed of the waves spikes slightly at 5,300 km as the waves travel from the outer to the inner core.

Sample Responses: 0 points

The graph shows the behavior of primary waves during an earthquake.
Click on each region of the graph where seismic waves entered different layers of Earth's interior.



The graph shows the behavior of primary waves during an earthquake.
Click on each region of the graph where seismic waves entered different layers of Earth's interior.



Notes on Scoring

These incorrect responses identify only one of the correct regions where the waves entered different layers of Earth. Correctly identifying both regions is required to earn credit.

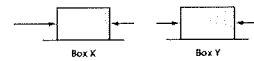
Grade 8
Science
EOY Practice Test

Question 15

Question and Scoring Guidelines

Question 15

Horizontal forces act on five boxes, initially at rest, as shown. The magnitude and direction of the horizontal forces are also shown.



What happens to Box X and Box Y as a result of the forces?

- A. Box X starts moving, speeding up, and Box Y remains at rest.
- B. Box X starts moving at constant speed, and Box Y remains at rest.
- C. Box X starts moving at constant speed, and Box Y starts moving, speeding up.
- D. Box X starts moving, speeding up, and Box Y starts moving at a constant speed.

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: Key – There are unbalanced forces acting on Box X, meaning it will change its speed. In addition, since Box Y is at rest and there are balanced forces acting on it, it will remain at rest.

Rationale for Option B: This is incorrect. It is true Box Y will remain at rest since it starts at rest and there are balanced forces acting on it. However, since Box X has an unbalanced force acting on it, it must change its motion.

Rationale for Option C: This is incorrect. There are unbalanced forces acting on Box X so it must change its motion. Also, since Box Y starts at rest and is acted on by balanced forces, it will remain at rest.

Rationale for Option D: This is incorrect. It is true Box X will start moving (speeding up) since it starts at rest and has an unbalanced force acting on it; however, since Box Y starts at rest and there are balanced forces acting on it, it will remain at rest.

Alignment

Content Strand

Physical Science

Content Statement

Forces have magnitude and direction.

Content Elaboration

"When the net force is greater than zero, the object's speed and/or direction will change.

When the net force is zero, the object remains at rest or continues to move at a constant speed in a straight line."

A force is described by its strength (magnitude) and in what direction it is acting. Many forces can act on a single object simultaneously. The forces acting on an object can be represented by arrows drawn on an isolated picture of the object (a force diagram). The direction of each arrow shows the direction of push or pull. When many forces act on an object, their combined effect is what influences the motion of that object. The sum of all the forces acting on an object depends not only on how strong the forces are, but also in what directions they act. Forces can cancel to a net force of zero if they are equal in strength and act in opposite directions. Such forces are said to be balanced. If all forces are balanced by equal forces in the opposite direction, the object will maintain its current motion (both speed and direction). This means that if the object is stationary, it will remain stationary. If the object is moving, it will continue moving in the same direction and at the same speed. Such qualitative, intuitive understandings and descriptions of inertia must be developed through inquiry activities.

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

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Explanation of the Item


This multiple choice item requires the student to interpret force diagrams and apply scientific reasoning to determine what happens to the motion of two boxes initially at rest.

For Box X, there is a net force acting to the right since the arrow going to the right is longer than the arrow to the left. A net force greater than zero causes a change in an object's speed. Since the box is initially at rest, it will speed up in the same direction as the force, to the right.

For Box Y, there is a net force of zero. The two forces cancel each other since they are pointing in opposite directions and are the same length, indicating they have the same strength; therefore, the forces are balanced. When a net force of zero acts upon an object, the object does not change its motion. Since Box Y starts at rest, it will remain at rest.

Sample Responses: 1 point

Horizontal forces act on two boxes. Initially at rest, as shown, the magnitude and direction of the horizontal forces are also shown.



What happens to Box X and Box Y as a result of the forces?

- Box X starts moving, speeding up, and Box Y remains at rest.
- Box X starts moving at constant speed, and Box Y remains at rest.
- Box X starts moving at constant speed, and Box Y starts moving, speeding up.
- Box X starts moving, speeding up, and Box Y starts moving at a constant speed.

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Grade 8 Science EOY Practice Test

Question 16

Question and Scoring Guidelines

Question 16

A scientist is studying a chemical reaction. She predicts that after the reaction the products will have less chemical potential energy than the reactants had originally.

The scientist observes the reaction, and notes that no light or sound is produced. However, other observations support the scientist's prediction that the total chemical potential energy has decreased.

Describe one observation that would support her prediction.

Type your answer in the space provided.

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

Score Point	Description
1 point	Response includes one of the following: <ul style="list-style-type: none">The reaction gives off heat/thermal energyThe reaction gets hotHeat/thermal energy is released/given off/producedDuring the reaction the temperature increases/goes up
0 points	The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be irrelevant to the item, or possibly, no other information is shown. The student may have written on a different topic or written, "I don't know."

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Alignment

Content Strand

Physical Science

Content Statement

There are different types of potential energy.

Content Elaboration

"Chemical potential energy is associated with the position and arrangement of the atoms within substances. Rearranging atoms into new positions to form new substances (chemical reaction) is evidence that the chemical potential energy has most likely changed. The energy transferred when a chemical system undergoes a reaction is often thermal energy."

Cognitive Demand

Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

Explanation of the Item

This is a short answer item in which the student's constructed response is machine-scored. This item requires the student to apply reasoning and their knowledge of how changes in chemical potential energy are related to thermal energy to determine and describe an observation that may indicate a decrease in chemical potential energy.

If chemical potential energy is decreasing, the energy must be transformed to another form, most likely thermal energy. Since energy is conserved, if the chemical potential energy decreases, the other form of energy must increase. Increasing thermal energy is indicated by the sample warming up and/or an increase in temperature.

This item is scored as 1 point with no partial credit.

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Grade 8 Science EOY Practice Test

Question 16

Sample Responses

Sample Responses: 1 point

Type your answer in the space provided.

One observation that would support her prediction would be that the test subject got hotter, transferring potential energy into thermal energy.

Notes on Scoring

This response earned 1 point for "The Test subject got hotter." The spelling and capitalization errors do not count against the student's response. The word "tranfering" should have been "transforming" but since this was not a part of the observation, this error was not counted against the student's response.

Type your answer in the space provided.

It says that heat is produced or would work produced, but heat energy could have been produced, causing the amount of chemical potential energy to decrease.

Notes on Scoring

This response earned 1 point for "heat energy could have been produced". Even though energy cannot be created, "produced" is vague and does not specifically imply "created," so the response was still awarded credit.

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Type your answer in the space provided.

The student's response observed that during the chemical reaction, the object was heating up and felt warmer. The chemical energy could have been converted into heat energy.

Notes on Scoring

The response earned 1 point for "during the chemical reaction, the object was heating up and felt warmer." The spelling and capitalization errors do not count against the student's response.

Sample Responses: 0 points

Type your answer in the space provided.

As the chemical reaction happens it loses its energy because in order for a reaction to happen, it needs to give something off and that is its chemical energy.

Notes on Scoring

While the student stated that "it loses its energy because in order for a reaction to happen, it needs to give something off and that is its chemical energy," this information is given in the prompt. This response did not earn credit because it did not identify an observation to support the prediction that chemical potential energy was decreased.

Type your answer in the space provided.

Energy is never lost - it only changes into other forms of energy, the light and sound produced by the reaction would be caused by the transition of chemical energy to either light or sound. This did not occur, though, because there was little chemical energy left to create light or sound.

Notes on Scoring

Much of this response is true. "Energy is never lost - it only changes into other forms of energy. The light and sound produced by the reaction would be caused by the transition of chemical energy to either light or sound; this did not occur." The response does not address the prompt, which asks the student to describe an observation to support the prediction that chemical potential energy had decreased. The student did describe producing heat and light, but these two options were given and ruled out by the prompt. ("The scientist observes the reaction, and notes that no light or sound is produced.")

**Grade 8
Science
EOY Practice Test**

Question 17

Question and Scoring Guidelines

Question 17

The table describes several methods scientists can use to date rock layers and fossils.

Dating Methods	
Dating Method	Description
Method 1	<ul style="list-style-type: none"> Uses carbon from organic matter Can determine ages from rocks or directly from fossils Used on samples up to about 100,000 years old
Method 2	<ul style="list-style-type: none"> Used on samples more than 100,000 years old Determines ages of igneous rocks
Method 3	<ul style="list-style-type: none"> Uses the number and patterns of tree rings to find the age of the tree Used on samples less than 11,000 years old
Method 4	<ul style="list-style-type: none"> Determines the last date a sediment sample was exposed to sunlight

A geologist wants to date several samples. Descriptions are provided for each sample. Because sampling can be expensive and time-consuming, the geologist only wants to use the dating methods that are likely to provide a relative date.

Select the boxes to show all methods that can be used to date each sample.

	Method 1	Method 2	Method 3	Method 4
A deeply buried sample of limestone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A piece of wood from a Native American cliff dwelling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A shallowly buried sample of shale that contains oyster and snail fossils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A dinosaur bone found in a sandstone layer that sits between two layers of basalt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Points Possible: 1

See **Alignment** for more detail.

Scoring Guidelines

For this item a full-credit response includes

- "Method 4" selected for "A deeply buried sample of limestone"
- AND
- "Method 1" AND "Method 3" selected for "A piece of wood from a Native American cliff dwelling"

AND

- "Method 1" AND "Method 4" selected for "A shallowly buried sample of shale that contains oyster and snail fossils"
- AND
- "Method 2" AND "Method 4" selected for "A dinosaur bone found in a sandstone layer that sits between two layers of basalt"
- AND
- No other boxes selected (1 point).

Alignment

Content Strand

Earth and Space Science

Content Statement

Evidence of the dynamic changes of Earth's surface through time is found in the geologic record.

There are different methods to determine relative and absolute age of some rock layers in the geologic record. Within a sequence of undisturbed sedimentary rocks, the oldest rocks are at the bottom (superposition). The geologic record can help identify past environmental and climate conditions.

Content Elaboration

The different methods used to determine the age of the Earth are an important factor in this concept. In elementary grades, fossils are used to compare what once lived to what lives now, but the concept of Earth's age and the age of the fossils were not included (the concept of billions or millions of years was not age-appropriate). In grade 8, the concept of index fossils is a way to build toward understanding relative dating. Superposition, crosscutting relationships and index fossils play an important role in determining relative age. Radiometric dating plays an important role in absolute age. The inclusion of new advances and studies (mainly due to developing technological advances) is important in learning about the geologic record.

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Cognitive Demand

Demonstrating Science Knowledge (D)

Requires students to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather and organize data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments. (Slightly altered from National Science Education Standards)

Note: Procedural knowledge (knowing how) is included in Recalling/Identifying Accurate Science.

Explanation of the Item

This item requires the student to analyze information about several rock and fossil samples to determine the appropriate dating technologies that can be used to most reliably date each sample. In analyzing the samples, the student needs to determine if the sample contains the materials necessary for each method as well as if the sample fits within the time period that method can reliably date.

Method 1 uses carbon from organic matter to date the sample; therefore, the sample must contain remains of a living organism that contains carbon such as wood, bone or shells. Method 1 can also only be used on samples up to 100,000 years old, so samples older than this time period cannot be reliably tested using this method.

Method 2 can only be used to determine the ages of igneous rocks such as basalt. Therefore this method cannot be used to date sedimentary rock such as limestone, sandstone or shale. The sample must also be less than 11,000 years old to be dated with this method.

Method 3 can only be used on samples containing remains of wood from trees. The number and pattern of tree rings can then be analyzed to determine the age of the wood in the sample.

Method 4 can be used only for samples composed of sediment, such as different types of sedimentary rock, in order to determine the last date the sediment was exposed to sunlight.

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Sample Response: 1 point

The table describes several methods scientists can use to date rock layers and fossils.

Dating Methods	
Dating Method	Description
Method 1	<ul style="list-style-type: none"> • Uses carbon from organic matter • Can determine ages from rocks or directly from fossils • Used on samples up to about 100,000 years old
Method 2	<ul style="list-style-type: none"> • Used on samples more than 100,000 years old • Determines ages of igneous rocks
Method 3	<ul style="list-style-type: none"> • Uses the number and patterns of tree rings to find the age of the tree • Used on samples less than 11,000 years old
Method 4	<ul style="list-style-type: none"> • Determines the last date a sediment sample was exposed to sunlight

A geologist wants to date several samples. Descriptions are provided for each sample. Because sampling can be expensive and time-consuming, the geologist only wants to use the dating methods that are likely to provide a reliable date.

Select the boxes to show all methods that can be used to date each sample.

	Method 1	Method 2	Method 3	Method 4
A deeply buried sample of limestone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
A piece of wood from a Native American cliff dwelling	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
A shallowly buried sample of shale that contains oyster and snail fossils	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
A dinosaur bone found in a sandstone layer that sits between two layers of basalt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Grade 8 Science EOY Practice Test

Question 17

Sample Responses

Notes on Scoring

For this item, a full-credit response includes only dating methods that are likely to provide a reliable date selected for each sample with no other incorrect boxes selected in that row.

For a deeply buried limestone sample, the only correct dating method is dating method 4; this method involves determining the last date a sediment sample was exposed to sunlight. Limestone is composed of sediments so this method would be reliable in this case.

For the piece of wood from a Native American cliff dwelling, the correct dating methods are method 1 and method 3. Method 1 is reliable for this sample because wood is organic matter that contains carbon. Method 3 is also a reliable dating method for this wood sample because it contains tree rings that can be analyzed to determine the age of the tree the wood sample came from.

For the shallowly buried sample of shale that contains oyster and snail fossils, the only correct dating methods are method 1 and method 4. Method 1 is a reliable dating method for this sample because the oyster and snail fossils in the sample are organic matter that contain carbon. Dating method 4 is also correct because shale is composed of sediment.

For the sample of a dinosaur bone found in a sandstone layer that sits between two layers of basalt, the only correct dating methods are method 2 and method 4. Method 2 is correct since this sample contains basalt, which is an igneous rock. Dating method 4 is also correct because sandstone is composed of sediment.

Sample Response: 0 points

The table describes several methods scientists can use to date rock layers and fossils.

Dating Methods

Dating Method	Description
Method 1	<ul style="list-style-type: none"> Uses carbon from organic matter Can determine ages from rocks or directly from fossils Used on samples up to about 100,000 years old
Method 2	<ul style="list-style-type: none"> Used on samples more than 100,000 years old Determines ages of igneous rocks
Method 3	<ul style="list-style-type: none"> Uses the number and patterns of tree rings to find the age of the tree Used on samples less than 11,000 years old
Method 4	<ul style="list-style-type: none"> Determines the last date a sediment sample was exposed to sunlight

A geologist wants to date several samples. Descriptions are provided for each sample. Because sampling can be expensive and time-consuming, the geologist only wants to use the dating methods that are likely to provide a reliable date.

Select the boxes to show all methods that can be used to date each sample.

	Method 1	Method 2	Method 3	Method 4
A deeply buried sample of limestone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A piece of wood from a Native American cliff dwelling	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A shallowly buried sample of shale that contains oyster and snail fossils	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
A dinosaur bone found in a sandstone layer that sits between two layers of basalt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Notes on Scoring

Method 1 is selected for all the samples but is only appropriate for the samples containing organic matter such as wood or oyster and snail fossils that are samples up to 100,000 years old. This method would not be reliable for dinosaur bones, which are known to be millions of years old.

Method 2 is incorrectly selected for the limestone sample, which is not an igneous rock.

Sample Response: 0 points

The table describes several methods scientists can use to date rock layers and fossils.

Dating Methods

Dating Method	Description
Method 1	<ul style="list-style-type: none"> Uses carbon from organic matter Can determine ages from rocks or directly from fossils Used on samples up to about 100,000 years old
Method 2	<ul style="list-style-type: none"> Used on samples more than 100,000 years old Determines ages of igneous rocks
Method 3	<ul style="list-style-type: none"> Uses the number and patterns of tree rings to find the age of the tree Used on samples less than 11,000 years old
Method 4	<ul style="list-style-type: none"> Determines the last date a sediment sample was exposed to sunlight

A geologist wants to date several samples. Descriptions are provided for each sample. Because sampling can be expensive and time-consuming, the geologist only wants to use the dating methods that are likely to provide a reliable date.

Select the boxes to show all methods that can be used to date each sample.

	Method 1	Method 2	Method 3	Method 4
A deeply buried sample of limestone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
A piece of wood from a Native American cliff dwelling	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
A shallowly buried sample of shale that contains oyster and snail fossils	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
A dinosaur bone found in a sandstone layer that sits between two layers of basalt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Notes on Scoring

Method 1 is incorrectly selected for the limestone sample as it does not contain organic matter.

Method 2 is incorrectly selected for limestone as it is not an igneous rock.

Method 4 is incorrectly selected for the wood sample as it does not contain sediment.

Grade 8 Science EOY Practice Test

Question 18

Question and Scoring Guidelines

Question 18

Two positively charged particles are attached to springs. A metal sphere is placed near each charged particle, as shown in the diagram.

Positive charge is slowly added to Sphere A. An equal amount of negative charge is slowly added to Sphere B. Assume the two systems are isolated from each other.

How does the elastic potential energy change for each of the springs?

- The elastic potential energy of both springs will increase equally.
- The elastic potential energy of both springs will decrease equally.
- The elastic potential energy of the spring in setup A will decrease and the elastic potential energy of the spring in setup B will increase.
- The elastic potential energy of the spring in setup A will increase and the elastic potential energy of the spring in setup B will decrease.

Points Possible: 1

See Alignment for more detail.

Scoring Guidelines

Rationale for Option A: Key – The elastic potential energy of a spring can be increased by either stretching or compressing the spring. Adding positive charge to Sphere A increases the repulsive force between the sphere and the particle, compressing the spring more and increasing the elastic potential energy of the spring. Adding negative charge to Sphere B increases the attractive force between the sphere and the particle, stretching the spring more and increasing the elastic potential energy of the spring. Since the strength of the force between the charged particles and spheres is equal, the change in elastic potential energy in the springs is equal.

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Rationale for Option B: This is incorrect. The elastic potential energy of a spring can be increased by either stretching or compressing the spring. Adding positive charge to Sphere A increases the repulsive force between the sphere and the particle, compressing the spring more and increasing the elastic potential energy of the spring. Adding negative charge to Sphere B increases the attractive force between the sphere and the particle, stretching the spring more and increasing the elastic potential energy of the spring.

Rationale for Option C: This is incorrect. The elastic potential energy of a spring can be increased by either stretching or compressing the spring. Adding positive charge to Sphere A increases the repulsive force between the sphere and the particle, compressing the spring more and increasing the elastic potential energy of the spring. Adding negative charge to Sphere B increases the attractive force between the sphere and the particle, stretching the spring more and increasing the elastic potential energy of the spring.

Rationale for Option D: This is incorrect. The elastic potential energy of a spring can be increased by either stretching or compressing the spring. Adding positive charge to Sphere A increases the repulsive force between the sphere and the particle, compressing the spring more and increasing the elastic potential energy of the spring. Adding negative charge to Sphere B increases the attractive force between the sphere and the particle, stretching the spring more and increasing the elastic potential energy of the spring.

Alignment

Content Strand
Physical Science

Content Statement
There are different types of potential energy.

Content Elaboration
“Elastic potential energy is associated with how much an elastic object has been stretched or compressed and how difficult such a compression or stretch is. A change in the amount of compression or stretch of an elastic object is evidence that the elastic potential energy has changed.”

Cognitive Demand
Interpreting and Communicating Science Concepts (C)

Requires students to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.

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Explanation of the Item

This multiple choice item requires the application of reasoning and scientific knowledge to determine the change in elastic potential energy of springs connected to a charge under the influence of other charges. Students must also recognize that springs can store elastic potential energy both when they are compressed and when they are stretched.

In Setup A, both the particles and the sphere are positive. These objects repel each other, compressing the spring. As positive charge is added to Sphere A, there is greater repulsion so the charges move farther apart, compressing the spring more and increasing the elastic potential energy.

In Setup B, the particle is positive and the sphere is negative. These objects attract each other, stretching the spring. As negative charge is added to Sphere B, there is greater attraction, so the charges move closer together, stretching the spring more and increasing the elastic potential energy.

Since the number of charges is equal in both cases, the amount of attractive or repulsive force is increased by the same amount; this, in turn, increases the stretch or compression and resulting elastic potential energy by the same amount.

Sample Response: 1 point

Two positively charged particles are attached to springs. A metal sphere is placed near each charged particle, as shown in the diagram.

Positive charge is slowly added to Sphere A. An equal amount of negative charge is slowly added to Sphere B. Assume the two systems are isolated from each other.

How does the elastic potential energy change for each of the springs?

- The elastic potential energy of both springs will increase equally.
- The elastic potential energy of both springs will decrease equally.
- The elastic potential energy of the spring in setup A will decrease and the elastic potential energy of the spring in setup B will increase.
- The elastic potential energy of the spring in setup A will increase and the elastic potential energy of the spring in setup B will decrease.

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