

# Ohio's State Tests

## ANSWER KEY & SCORING GUIDELINES

SPRING 2015

GRADE 8  
SCIENCE

PART 1

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Grade 8 Science  
PBA Practice Test  
Content Summary and Answer Key

Question No.	Item Type	Content Strand	Content Statement	Answer Key	Points
1	Graphic Response	Physical Science	Forces have magnitude and direction.	---	2 points
2	Graphic Response	Earth and Space Science	A combination of constructive and destructive geologic processes formed Earth's surface.	---	2 points
3	Short Response	Earth and Space Science	Evidence of the dynamic changes of Earth's surface through time is found in the geologic record.	---	2 points
4	Extended Response	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.	---	4 points

**Grade 8  
Science  
PBA Practice Test**

**Question 1**

**Question and Scoring Guidelines**

3



**Question 1**

A car and two buses are driving on a highway. The blue arrows represent the direction and magnitude of each vehicle's motion relative to the ground.

Place a red arrow or "No Motion" label in each blank box to show the relative direction and magnitude of each vehicle's motion from the reference point of the car.

- Place only one arrow/label in each blank box.
- You may use each arrow/label more than once.

Points Possible: 2

See [Alignment](#) for more detail.

**Scoring Guidelines**

For this item, a full-credit response includes

- "No Motion" in the car's box
- AND
- shortest right arrow in the Bus 2's box
- AND
- longest right arrow in the Bus 1's box (2 points).

For this item, a partial-credit response includes

- any 2 out of 3 correctly placed arrows and/or "No Motion" label (1 point).

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**Alignment**

Content Strand  
Physical Science

Content Statement  
Forces have magnitude and direction.

Content Elaboration  
"The motion of an object is always measured with respect to a reference point."

"Motion can be described in different ways by different observers (e.g., a pencil held in someone's hand may appear to be at rest, but to an observer in a car speeding by, the pencil may appear to be moving backward)."

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 graphic response item requires the student to apply reasoning to determine the motions of two buses relative to a moving car.

In this item, the reference point is the car, which is moving at the fastest speed and to the left. If the driver observes an object inside the car, relative to the car, the object does not appear to be in motion.

Bus 1 and bus 2 are moving at the same speed, but in opposite directions. Since the car is moving faster, but in the same direction as bus 2, the car pulls farther and farther ahead of bus 2; therefore, relative to the car, it appears bus 2 is moving backward or to the right.

Since bus 1 is moving in the opposite direction as the car, it car pulls farther ahead of bus 1 at a faster rate than it pulls ahead of bus 2; therefore, relative to the car, it appears bus 1 is also moving backward or to the right at a faster speed than bus 2.

The student needs to correctly identify all three responses to earn 2 points. Correctly identifying two of the three responses can earn the student 1 point.

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**Grade 8  
Science  
PBA Practice Test**

**Question 1**

**Sample Responses**

6



Sample Response: 2 points

A car and two buses are driving on a highway. The blue arrows represent the direction and magnitude of each vehicle's motion relative to the ground.

Place a red arrow or "No Motion" label in each blank box to show the relative direction and magnitude of each vehicle's motion from the reference point of the car.

- Place only one arrow/label in each blank box.
- You may use each arrow/label more than once.

**Notes on Scoring**

This response earns the full two points. The response correctly indicates that relative to the car, the car has no motion, bus 2 has motion in the opposite direction and bus 1 has a faster motion in the opposite direction.

Sample Response: 1 point

A car and two buses are driving on a highway. The blue arrows represent the direction and magnitude of each vehicle's motion relative to the ground.

Place a red arrow or "No Motion" label in each blank box to show the relative direction and magnitude of each vehicle's motion from the reference point of the car.

- Place only one arrow/label in each blank box.
- You may use each arrow/label more than once.

**Notes on Scoring**

This response earns one of the two points. The response correctly indicates that relative to the car, the car has no motion and bus 1 has a faster motion in the opposite direction; however, the response incorrectly indicates that relative to the car, bus 2 has a fast motion in the same direction as the car.

Sample Response: 0 points

A car and two buses are driving on a highway. The blue arrows represent the direction and magnitude of each vehicle's motion relative to the ground.

Place a red arrow or "No Motion" label in each blank box to show the relative direction and magnitude of each vehicle's motion from the reference point of the car.

- Place only one arrow/label in each blank box.
- You may use each arrow/label more than once.

**Notes on Scoring**

This response does not earn any credit. The response correctly indicates that relative to the car, the car has no motion; however, the response incorrectly indicates that relative to the car, bus 2 is moving to the left. While the response correctly indicates the motion of bus 1 is to the right, it incorrectly shows it having a slower speed than bus 2, so this motion is also incorrect. Therefore, only one of the motions is fully correct. The response must correctly indicate two of the three motions to earn one point.

Sample Response: 0 points

A car and two buses are driving on a highway. The blue arrows represent the direction and magnitude of each vehicle's motion relative to the ground.

Place a red arrow or "No Motion" label in each blank box to show the relative direction and magnitude of each vehicle's motion from the reference point of the car.

- Place only one arrow/label in each blank box.
- You may use each arrow/label more than once.

**Notes on Scoring**

This response does not earn any credit. The response incorrectly indicates that relative to the car, the car has a fast motion to the left. The response also incorrectly indicates that relative to the car, bus 2 is moving to the left. The response correctly indicates the motion of bus 1 is to the right; however, the response must correctly indicate two of the three motions to earn one point.

**Grade 8  
Science  
PBA Practice Test**

**Question 2**

**Question and Scoring Guidelines**

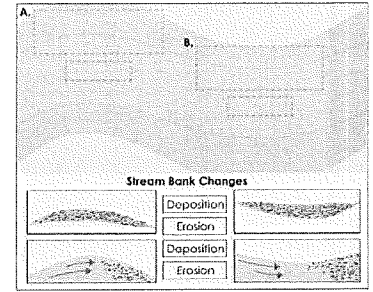
**Question 2**

The diagram shows a portion of a stream from above. Predict how the banks of the stream will change over time.

A. Move an image into the blank box to show what bank A will look like over time. Move a label into the box underneath the bank that describes the process occurring.

B. Move an image into the blank box to show what bank B will look like over time. Move a label into the box underneath the bank that describes the process occurring.

• Use only one object in each blank box.



**Points Possible: 2**

See [Alignment](#) for more detail.

**Scoring Guidelines**

For this item, a full-credit response includes

- The image of sediment moving with the curve in box A AND the image of still sediment sitting in the curve in box B
- AND
- The "erosion" label in box A
- AND
- The "deposition" label in box B (2 points).

For this item, a partial-credit response includes

- The image of still sediment sitting in the curve in box A AND the "deposition" label in box A
- AND
- The image of sediment moving with the curve in box B AND the "erosion" label in box B (1 point).

**Alignment**

Content Strand

Earth and Space Science

Content Statement

A combination of constructive and destructive geologic processes formed Earth's surface.

Content Elaboration

Distinguishing between major geologic processes (e.g., tectonic activity, erosion, deposition) and the resulting feature on the surface of Earth is the focus of this content statement.

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 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 and distinguish between the constructive and destructive processes of erosion and deposition and how the banks of the stream will change over time as a result of these processes. It requires students to correctly identify erosion as a destructive process and deposition as a constructive process.

At a bend in a stream the water's momentum forces the mass of the water against the outer bank eroding away sediment on the bank. The force of moving water carries the eroded sediments downstream where those sediments are deposited. Deposition of the sediments occurs when the moving water slows down and is unable to carry the sediment.

**Grade 8  
Science  
PBA Practice Test**

**Question 2**

**Sample Responses**

Sample Response: 2 points

The diagram shows a portion of a stream from above. Predict how the banks of the stream will change over time.

A. Move an image into the blank box to show what bank A will look like over time. Move a label into the box underneath the bank that describes the process occurring.

B. Move an image into the blank box to show what bank B will look like over time. Move a label into the box underneath the bank that describes the process occurring.

- Use only one object in each blank box.

**Notes on Scoring**

This response correctly identifies both the correct process label and associated image as well as the correct stream bank locations where each process would occur. The response correctly shows the image of the sediment eroding away and carried downstream in bank A and the image of the still sediment deposited in the bend in bank B. The erosion label is correctly placed at location A and the deposition label at location B.



Sample Response: 1 point

The diagram shows a portion of a stream from above. Predict how the banks of the stream will change over time.

A. Move an image into the blank box to show what bank A will look like over time. Move a label into the box underneath the bank that describes the process occurring.

B. Move an image into the blank box to show what bank B will look like over time. Move a label into the box underneath the bank that describes the process occurring.

- Use only one object in each blank box.

**Notes on Scoring**

This response would receive one point for showing partial understanding of the content by correctly matching the deposition and erosion labels with their respective images. This response fails to demonstrate how the stream flow direction typically results in erosion upstream where the force of moving water carries sediments downstream where those sediments are deposited. Deposition occurs when the moving water slows down and is unable to carry the sediment. The stream bank locations of the deposition and erosion processes are not correctly identified; therefore, this response does not receive full credit.



Sample Response: 0 points

The diagram shows a portion of a stream from above. Predict how the banks of the stream will change over time.

A. Move an image into the blank box to show what bank A will look like over time. Move a label into the box underneath the bank that describes the process occurring.

B. Move an image into the blank box to show what bank B will look like over time. Move a label into the box underneath the bank that describes the process occurring.

- Use only one object in each blank box.

**Notes on Scoring**

This response is incorrect because although the erosion and deposition labels are placed in the correct bank locations, the labels are incorrectly matched to the image of the process and therefore receives no credit.



Sample Response: 0 points

The diagram shows a portion of a stream from above. Predict how the banks of the stream will change over time.

A. Move an image into the blank box to show what bank A will look like over time. Move a label into the box underneath the bank that describes the process occurring.

B. Move an image into the blank box to show what bank B will look like over time. Move a label into the box underneath the bank that describes the process occurring.

- Use only one object in each blank box.

**Notes on Scoring**

In this response, although the process images are placed in the correct bank locations, the labels are incorrectly matched with each process and therefore receives no credit.



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Question 3

Question and Scoring Guidelines

Question 3

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from the study.

**Geological Cross Section**

Flow      Intrusion

Key	
Gravel	Volcanic Ash
Limestone	Shale
Sandstone	Basalt

Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

Points Possible: 2

See Alignment for more detail.

Scoring Guidelines

- 2 points The response provides a complete interpretation and/or correct solution. It demonstrates a thorough understanding of the concept or task. It indicates logical reasoning and conclusions. It is accurate, relevant and complete. The response correctly
- Explains how the geologist knows the relative age of the intrusion as compared with the gravel
- AND
- Explains how the geologist knows that the flow is older than the intrusion.
- 1 point The response provides evidence of a partial interpretation and/or solution process. It demonstrates an incomplete understanding of the concept or task. It contains minor flaws in reasoning. It neglects to address some aspect of the concept or task. The response correctly
- Explains how the geologist knows the relative age of the intrusion as compared with the gravel
- OR
- Explains how the geologist knows that the flow is older than the intrusion.
- 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. The response may provide an incorrect solution/response.

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.

Earth is approximately 4.6 billion years old. Earth history is based on observations of the geologic record and the understanding that processes observed at present day are similar to those that occurred in the past (uniformitarianism). 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).

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.

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 interpretation of a geological cross section to explain the relative age of geologic formations. The student will be required to use conceptual knowledge of superposition, crosscutting relationships and index fossils to explain how relative age is determined. The intrusion is older than the gravel because the gravel was deposited after the erosion took place and the intrusion was cut by the erosion. The flow is older than the intrusion because the flow is folded, which means that it had to be there when the rest of the sediments were folded. This happened before the intrusion because the intrusion is not folded.

This is a 2-point item. To earn the full-credit 2 points, the response must correctly explain both how the geologist knows the relative age of the intrusion as compared with the gravel as well as correctly explain how the geologist knows that the flow is older than the intrusion.

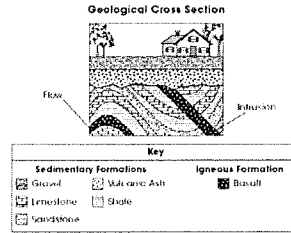
# Grade 8 Science PBA Practice Test

## Question 3

### Sample Responses

### Sample Response: 2 points

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.



Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

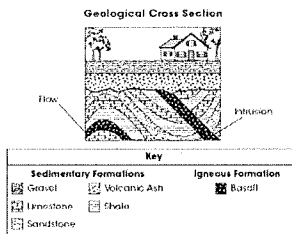
The intrusion starts several layers below the ground, so it is older relative to the gravel. The flow is older than the intrusion because the flow occurs beneath several layers of sedimentary rock that the intrusion seems to have just cut through.

#### Notes on Scoring

This response correctly interprets the cross section to determine that "the intrusion starts several layers below the gravel so it is older relative to the gravel." This response shows understanding of the law of superposition. This response also correctly states that "the flow occurs beneath several layers of sedimentary rock that the intrusion seems to have just cut through." This statement shows an understanding that the flow is older than the intrusion because the sediments were deposited on top of the flow that was later cut across by an intrusion.

### Sample Response: 2 points

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.



Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

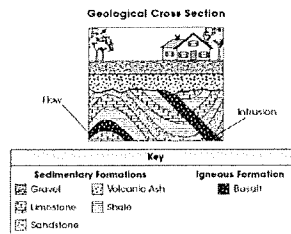
The cross section shows age between the intrusion and gravel because the gravel is above the intrusion and the top layer means that it is younger than the intrusion. The flow is older than the intrusion because the flow is a path that is curved and passes over curved by tectonic deformation and the intrusion is straight and flat and has not been deformed by tectonic deformation.

#### Notes on Scoring

This response correctly interprets the cross section to determine that "the gravel is above the intrusion and the top layer means that it is younger." This response also correctly states that "the flow is a path that is curved and possibly curved by tectonic deformation and the intrusion is a straight line of Basalt and has not been deformed by tectonic deformation." This response demonstrates an understanding that the flow is older than the intrusion because the flow is folded or curved, which means that it had to be there when the rest of the sediments were folded. Therefore, this occurred before the basalt intrusion due to the fact that the intrusion is not folded.

### Sample Response: 1 point

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.



Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

The geologist knows the age of the intrusion because it is lower than the gravel (basalt is on the top of the newest rock). The geologist knows the flow is older because it is further down in the ground.

#### Notes on Scoring

This response receives one point for correctly interpreting the cross section to explain how the geologist knows the relative age of the intrusion as compared with the gravel by stating "it is lower than the gravel. Whatever on top is the newest rock." This response states that "the flow is further down in the ground," which is a vague statement, since both the flow and the intrusion are at the bottom most sections of the graphic; furthermore, this statement does not explain how the geologist knows that the flow is older than the intrusion.

Sample Response: 1 point

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.

**Geological Cross Section**

Flow      Intrusion

Key	
<b>Sedimentary Formations</b>	<b>Igneous Formation</b>
Gravel	Volcanic Ash
Limestone	Shale
Sandstone	Basalt

Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

The geologist can tell the relative age of the intrusion by carbon dating the rocks surrounding. The geologist knows that the flow is older than the intrusion because the flow is beneath the younger rocks the intrusion cut through the younger rocks.

**Notes on Scoring**

This response receives one point for correctly interpreting the cross section to explain how the geologist knows that the flow is older than the intrusion. This response states that "the flow is beneath the younger rocks the intrusion cuts straight through the younger rocks." This statement shows an understanding that the flow is older than the intrusion because the sediments were deposited on top of the flow that was later cut across by an intrusion. The response for how the geologist knows the relative age of the intrusion as compared with the gravel incorrectly states that "The geologist can tell the relative age of the intrusion by carbon dating the rocks surrounding."



Sample Response: 0 points

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.

**Geological Cross Section**

Flow      Intrusion

Key	
<b>Sedimentary Formations</b>	<b>Igneous Formation</b>
Gravel	Volcanic Ash
Limestone	Shale
Sandstone	Basalt

Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

The geologist knows the intrusion compared to the gravel because the intrusion has a yellow location which makes it possible for them to see how long it has been there. The geologist knows that the flow is older than the intrusion because of the direction it's going.

**Notes on Scoring**

This response is incorrect and does not explain how the geologist knows the relative age of the intrusion as compared with the gravel or explain how the geologist knows that the flow is older than the intrusion in terms of the law of superposition.



Sample Response: 0 points

A geologist is investigating the history of an area that has experienced various geological events, including sedimentation, erosion, tectonic deformation, and volcanic eruptions. The diagram shows the cross section produced from her study.

**Geological Cross Section**

Flow      Intrusion

Key	
<b>Sedimentary Formations</b>	<b>Igneous Formation</b>
Gravel	Volcanic Ash
Limestone	Shale
Sandstone	Basalt

Using the cross section, explain how the geologist knows the relative age of the intrusion compared with that of the gravel. Then, explain how the geologist knows that the flow is older than the intrusion. Type your answer in the space provided.

The geologist knows the intrusion relative age because it was not formed in with the sedimentary formations yet. The knows that the flow is older because it was formed into the same space as the sedimentary formations that.

**Notes on Scoring**

This response is incorrect and does not explain how the geologist knows the relative age of the intrusion as compared with the gravel or explain how the geologist knows that the flow is older than the intrusion in terms of the law of superposition.





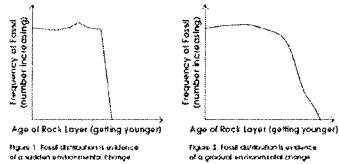
Grade 8  
Science  
PBA Practice Test

Question 4

Question and Scoring Guidelines

Question 4

Several fish species become extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.



Explain why the distribution of the fossils in figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.  
Describe an environmental change that could have produced this kind of fossil distribution.  
Explain why the distribution of the fossils in figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.  
Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

Points Possible: 4

See Alignment for more detail.



Scoring Guidelines

- 4 points The focus of this item is on demonstrating an understanding of the fossil record as evidence of environmental change and an understanding of the types of environmental changes that cause gradual and sudden extinction.
- The response:
- Provides an appropriate explanation of how the distribution of the fossils in figure 1 supports a hypothesis of sudden environmental change (describe graph figure 1)
  - Describes a plausible environmental change that could have led to the rapid extinction of these fish species
  - Provides an appropriate explanation of how the distribution of the fossils in figure 2 supports a hypothesis of gradual environmental change (describe graph figure 2)
  - Describes a plausible environmental change that could have led to the gradual extinction of these fish species
- 3 points The response shows partial evidence of understanding the fossil record as evidence of environmental change and/or a partial understanding of the types of environmental changes that cause gradual and sudden extinction by providing only three of the four bullets listed above.
- Possible errors may include:
- An inaccurate explanation of why the distribution of fossils in figure 1 suggests extinction as a result of a sudden environmental change (failure to describe the graph in figure 1)
  - An inappropriate type of environmental change as the cause of a sudden extinction
  - An inaccurate explanation of why the distribution of fossils in figure 2 suggests extinction as a result of a gradual environmental change (failure to describe the graph in figure 2)
  - An inappropriate type of environmental change as the cause of a gradual extinction

- 2 points The response provides two of the four bullets listed above.
- 1 point The response provides one of the four bullets listed above.
- 0 points The response indicates inadequate or no understanding of the fossil record as evidence of environmental change or understanding of the types of environmental changes that cause gradual extinction. For example, the response may provide an inappropriate or incorrect explanation of why the distribution of fossils in the diagram suggests extinction as a result of a gradual environmental change and an inappropriate type of environmental change as the cause of a gradual extinction. The response does not meet the criteria required to earn one point. It may only repeat information given in the test item. The response may provide supportive information that is totally 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."

Alignment

Content Strand  
Life Science

Content Statement

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

Earth is approximately 4.6 billion years old. Earth history is based on observations of the geologic record and the understanding that processes observed at present day are similar to those that occurred in the past (uniformitarianism). 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.

Note: Environmental and climate conditions also can be documented through the cryosphere as seen through ice cores.



### Content Elaboration

Uniformitarianism can be an important key in understanding how scientists have interpreted the environmental conditions that existed throughout Earth's history. Fossil evidence also can indicate specific environments and climate conditions that help interpret the geologic record.

Analyzing and interpreting the data to draw conclusions about geologic history is an important part of this content statement.

### 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 analyzing fossil data to explain how the fossil distribution supports a hypothesis of an extinction of fish species as a result of environmental change. This item requires the student to explain how Figure 1 supports the hypothesis that the extinction of the fossils was the result of a sudden environmental change and how Figure 2 supports the hypothesis of extinction due to gradual environmental change. This item then requires the description of a scenario for both a sudden and gradual environmental change that could cause this extinction, using conceptual knowledge of superposition and the use of geologic record in identifying past environmental conditions.

The law of superposition states that sedimentary layers are deposited in a time sequence, with the oldest on the bottom and the youngest on the top. Both graphs show the number of fish fossils decreasing with each younger rock layer in the geologic column. Figure 1 shows a sharp decline in fossils supporting the hypothesis of a sudden extinction due to a sudden environmental change such as a meteorite impact or volcanic eruption. Figure 2 shows a gradual decline in fossils indicating a gradual extinction possibly due to changes in climate, food sources or predators.

## Grade 8 Science PBA Practice Test

### Question 4

### Sample Responses

### Sample Response: 4 points

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.

Figure 1: fossil distribution is evidence of a sudden environmental change.  
Figure 2: fossil distribution is evidence of a gradual environmental change.

Explain why the distribution of the fossils in figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.  
Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.  
Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B Z U F, ( : : : : : )

Figure 1 graph indicates a sudden environmental change. Because all of the sudden there is a sharp line in the line showing all of the sudden remaining happened to turn in that period. And so, this could be caused by a meteorite or sudden climate change.

The graph in figure 2 shows a steady decline because the use gradually starts going down, not steadily. This could be caused by 1 species being out, then another, and then the rest. Or just because there was no food. It could also be caused by a slow climate change.

### Notes on Scoring

This response provides an appropriate explanation of how the distribution of the fossils in Figure 1 supports a hypothesis of a sudden environmental change by stating, "all of the sudden there is a sharp turn in the line saying all of the sudden something happened to turn all these animals extinct." This response correctly describes the slope of graph in Figure 1 that supports the hypothesis.

This response provides a plausible environmental change that could have led to this sudden extinction by stating "could be caused by a meteor." A meteor is a valid example of an environmental change that would lead to a rapid extinction event.

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "the line gradually starts going down, not instantly." This response correctly describes the slope of graph in Figure 2 that supports the hypothesis.

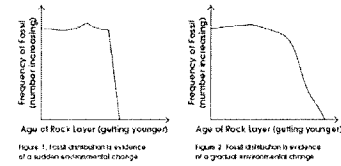
This response provides a plausible environmental change that could have led to a gradual extinction by stating, "1 species dieing out, then another, and then the rest die out because there was no food." This response describes how changes in the food web could cause a gradual extinction of the fish fossil species.

39



### Sample Response: 4 points

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B / U / L / I / D / E / A / Q

Figure 1 shows a sudden environmental change. I know this because the graph suddenly drops without warning. An environmental change that could cause this a sudden change is a volcanic eruption that decreased oxygen in the water.

In Figure 2, there is a gradual drop in the graph so that means there was a gradual environmental change such as a growing population of predators.

40



### Notes on Scoring

This response provides an appropriate explanation of how the distribution of the fossils in Figure 1 supports a hypothesis of a sudden environmental change by stating, "the graph suddenly drops." This response correctly describes the slope of graph in Figure 1 that supports the hypothesis.

This response provides a plausible environmental change that could have led to this sudden extinction by stating, "such things as a volcano eruption." A volcanic eruption is a valid example of an environmental change that would lead to a rapid extinction event.

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "there is a gradual drop in the graph." This response correctly describes the slope of graph in Figure 2 that supports the hypothesis.

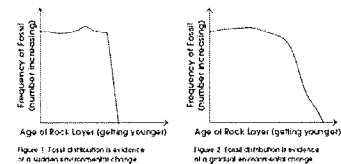
This response provides a plausible environmental change that could have led to a gradual extinction by stating that it may have been the result of, "a growing population of a predator." This response correctly identifies that an increase in predators could cause a gradual extinction of the fish fossil species.

41



### Sample Response: 3 points

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B / U / L / I / D / E / A / Q

The first chart in figure 1 supports the fact that the extinction of these species was a result of a sudden environmental change. It does this by showing that the number of fossils suddenly drops to zero. This change that could have caused an abrupt change in the environment was an asteroid that hit the earth.

The second figure two supports the theory that the extinction of these species was the result of a gradual environmental change. It does this by showing the number of fossils slowly decreasing over time. An environmental change that may have caused this was a change in the food chain or climate that made it hard for animals to survive.

42



### Notes on Scoring

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "does this by making the declining line slope down slowly"; then by comparison, "rather than drop down straight off," the student describes Figure 1. This response correctly describes the slope of both graphs.

This response provides a plausible environmental change that could have led to this sudden extinction by using the example, "an asteroid that hit Earth's surface." An asteroid collision is a valid example of an environmental change that would lead to a rapid extinction event.

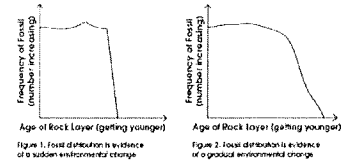
This response does not provide an example of a plausible environmental change that could have led to a gradual extinction.

43



### Sample Response: 3 points

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B I U L I D I I

IT COULD BE A RESULT OF A SUDDEN ENVIRONMENTAL CHANGE BECAUSE THE FISHES ARE GOING AT A NORMAL PACE BUT THEN IT SUDDENLY JUST DROPS OFF. THERE COULD HAVE BEEN A PERIOD OF CALM BUT THE FISHES COULD BE EATEN BY A PREDATOR. COULD BE BECAUSE THE FISHES WERE JUST SLOWLY GOING DOWN AS OPPOSED TO ALMOST JUST DROPPING OFF. A NEW KIND OF ANIMAL THAT EATS FISH COULD HAVE COME UP SO THE FISH WOULD SLOWLY START GOING AWAY.

44



### Notes on Scoring

This response provides an appropriate explanation of how the distribution of the fossils in Figure 1 supports a hypothesis of a sudden environmental change by stating, "FISHES ARE GOING AT A NORMAL PACE, BUT THEN IT SUDDENLY JUST DROPS OFF." This response correctly describes the slope of graph in Figure 1 that supports the hypothesis.

The sudden environmental change provided in the response, "A KIND OF OIL SPILL," would not receive credit as it is not plausible. The example given in this response is of a human-induced change during a time period long before humans were present on Earth.

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "THE LINE IS JUST SLOWLY GOING DOWN." This response correctly describes the slope of graph in Figure 2 that supports the hypothesis.

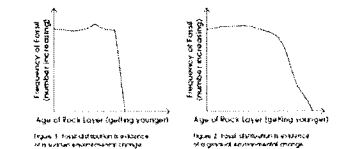
This response provides a plausible environmental change that could have led to a gradual extinction by stating that it may have been the result of, "A NEW KIND OF ANIMAL THAT EATS FISH COULD HAVE COME UP SO THE FISH WOULD SLOWLY START GOING AWAY." This response correctly identifies that the introduction of a new predator could cause a gradual extinction of the fish fossil species.

45



### Sample Response: 2 points

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B I U L I D I I

Figure 1 supports this hypothesis because there is a extreme drop in the line. A environmental change is possibly a drought of time. In a Figure 2 supports the hypothesis because the line is a small decrease over time. An environmental change could be a drought over time. The fish are slowly going away.

46



**Notes on Scoring**

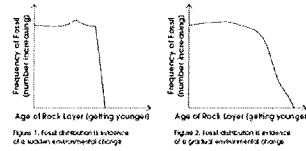
This response provides an appropriate explanation of how the distribution of the fossils in Figure 1 supports a hypothesis of a sudden environmental change by stating, "there is a extreme drop." This response correctly describes the slope of graph in Figure 1 that supports the hypothesis.

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "the chart sho a small Decrease over time." This response correctly describes the slope of graph in Figure 2 that supports the hypothesis.

This response fails to provide plausible environmental changes that could have led to either a sudden or a gradual extinction.

**Sample Response: 2 points**

Several fish species become extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several unstratified layers of sedimentary rock, observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B U Q A G E [ ... ] [ ... ] [ ... ] [ ... ] [ ... ]

\* This is not an appropriate response for Figure 1 because the slope of the line is at a steep incline. An example could be a volcanic eruption that kills species of a sudden and possibly through the air. In Figure 2, the slope is a gradual decline over time. An example could be a gradual increase in sea level. An environmental change that could have produced this kind of fossil distribution would be a gradual increase in sea level.



**Notes on Scoring**

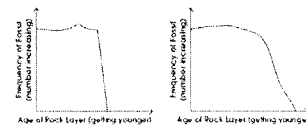
This response provides an appropriate explanation of how the distribution of the fossils in Figure 1 supports a hypothesis of a sudden environmental change by stating, "the slope of the line is at a steep incline." This response correctly describes the slope of graph in Figure 1 that supports the hypothesis.

This response provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "the slope is gradual." This response correctly describes the slope of graph in Figure 2 that supports the hypothesis.

This response fails to provide plausible environmental changes that could have led to either a sudden or a gradual extinction.

**Sample Response: 1 point**

Several fish species become extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several unstratified layers of sedimentary rock, observable in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

B U Q A G E [ ... ] [ ... ] [ ... ] [ ... ] [ ... ]

\* This is not an appropriate response for Figure 1 because the slope of the line is at a steep incline. An example could be a volcanic eruption that kills species of a sudden and possibly through the air. In Figure 2, the slope is a gradual decline over time. An example could be a gradual increase in sea level. An environmental change that could have produced this kind of fossil distribution would be a gradual increase in sea level.



**Notes on Scoring**

This response correctly provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "it stayed the same for a long time then slowly decreased a little by a little." The response does not describe Figure 1 and fails to provide plausible environmental changes that could have led to either a sudden or a gradual extinction.

**Sample Response: 1 point**

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock deposited in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

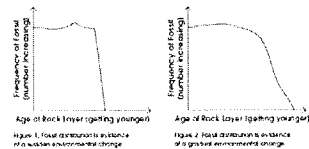
The fossils in Figure 1 are a result of a sudden environmental change. That could be caused by both species and fossil distribution up to the extinction point. It is a sudden change because the fossils are all found in the same layer. The fossils in Figure 2 are a result of a gradual environmental change. That could be caused by both species and fossil distribution up to the extinction point. It is a gradual change because the fossils are found in several layers of rock.

**Notes on Scoring**

This response correctly provides an appropriate explanation of how the distribution of the fossils in Figure 2 supports a hypothesis of a gradual environmental change by stating, "it took a much longer time for figure 2. To form in the much smother shape because it took much longer for the extinction." The response does not describe Figure 1 and fails to provide plausible environmental changes that could have led to either a sudden or a gradual extinction.

**Sample Response: 0 points**

Several fish species became extinct millions of years ago. The graphs below show the distribution of fossils of these fishes as they occur in several undisturbed layers of sedimentary rock deposited in a cliff face.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

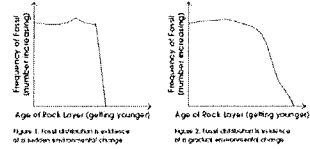
The distribution of the fossils in the graphs below that some fishy happened and killed them off fast. In graph 2 why did it happen and how did it occur?

**Notes on Scoring**

This response fails to explain why the graphs support either hypothesis or provide plausible environmental changes that could have led to either a sudden or a gradual extinction.

**Sample Response: 0 points**

Several fish species became extinct millions of years ago. Two graphs below show the distribution of fossils of these fishes at two different locations of rock layers that date back to a certain age.



Explain why the distribution of the fossils in Figure 1 supports the hypothesis that the extinction of these species was a result of a sudden environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Explain why the distribution of the fossils in Figure 2 supports the hypothesis that the extinction of these species was a result of a gradual environmental change.

Describe an environmental change that could have produced this kind of fossil distribution.

Type your answer in the space provided.

Rich, Bold, Italic, Underline, Text Color, Bulleted List, Numbered List, Indent, Undo, Redo, Clear

The volume of text in this question is limited to 1000 characters.



**Notes on Scoring**

This response indicates a lack of understanding of how the fossil record is used as evidence of environmental change or how types of environmental changes cause extinction.

