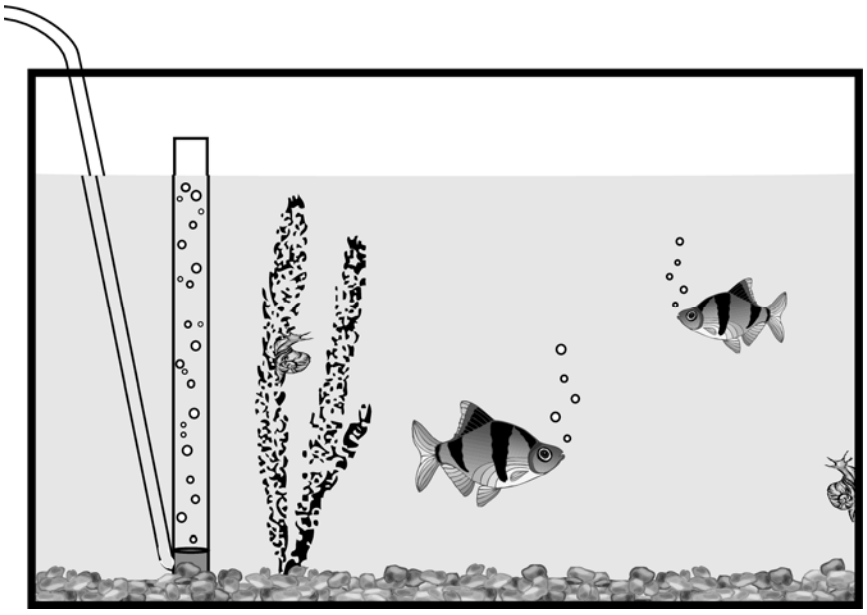
**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 1**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | F. Describe the properties of light and sound energy. |
| GLI: | 5.PS.F.5<br>Explore and summarize observations of the transmission, bending (refraction) and reflection of light. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | explains |
| Keywords: | light refraction, light absorption, light reflection, Properties of Light |

**Multiple Choice Question:**

An air hose extends above and below the surface of the water.



1. Which statement explains why the air hose looks broken at the surface of the water?

   A. Light is refracted as it moves from air to water.
   B. Light is reflected as it moves from air to water.
   C. Light is absorbed as it moves from air to water.
   D. Light is destroyed as it moves from air to water.

**Commentary:**

This multiple choice question asks students to explain why an air hose in an aquarium appears broken at the surface of the water. Students must recall that light bends as it moves from one material into another and that the bending of light is called refraction. Students should apply this knowledge to recognize that as light passes from the air into the water, it is refracted or bent

by the water. The bending of the light makes the hose appear as if it is in one place at the surface of the water and at another place below the surface of the water. Answer choice A is correct because the refraction of light by water causes the hose to appear broken (to be in a different location below the water, than it appears to be above the water). Answer choice B is incorrect because reflection is the process of bouncing light back towards the direction from which it was traveling. Although reflection may occur (i.e., you may see your face in the glass tank of an aquarium), reflection does not make the hose look broken. Answer choice C is incorrect because absorption does not make the hose look broken at the surface of the water. Light may be absorbed by a material as energy (i.e., some light may be absorbed by the dark stones in the gravel or the dark lines on the fish) but absorption is not the process that makes the hose look broken. Answer choice D is incorrect because light energy is not destroyed. The law of conservation of energy states that energy is never created or destroyed.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to recall information about the properties and behavior of light. Students must recall the correct definitions of reflect, refract and absorb in order to identify the process that causes an object to appear broken above and below the surface of water.

**Performance Data:**

The percent of public school students selecting answer choice A for question 1 on the May 2007 Ohio Grade 5 Achievement Test for Science was 59%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 2**

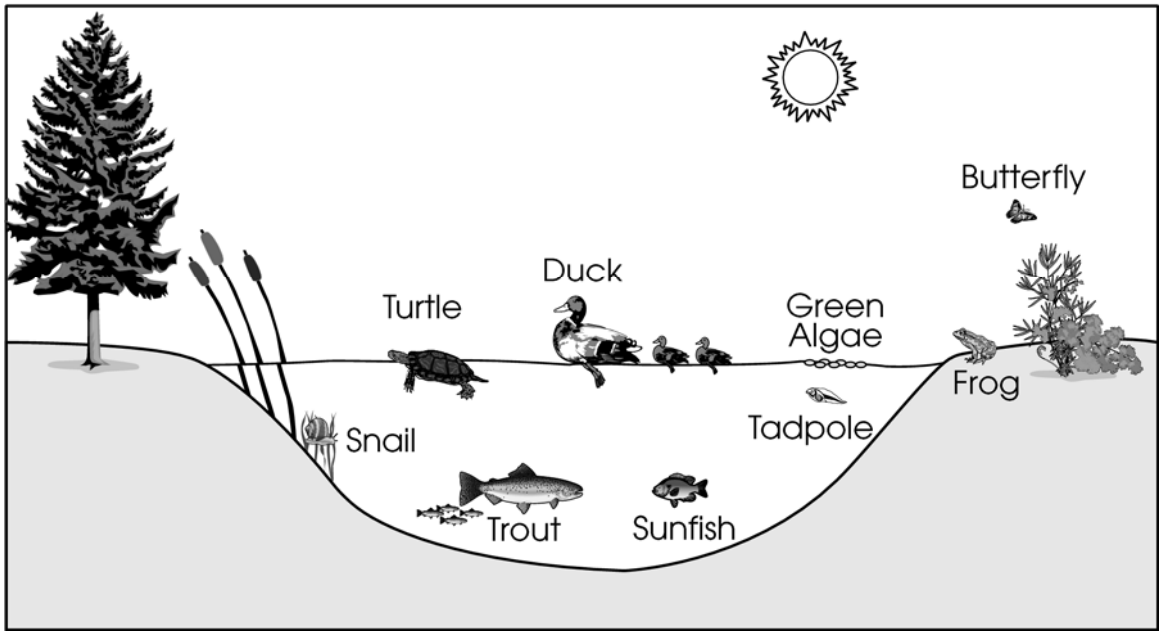
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | C. Compare changes in an organism's ecosystem/habitat that affect its survival. |
| GLI: | 5.LS.C.4<br>Summarize that organisms can survive only in ecosystems in which their needs can be met (e.g., food, water, shelter, air, carrying capacity and waste disposal). The world has different ecosystems and distinct ecosystems support the lives of different types of organisms. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | ecosystem, oxygen, pond ecosystem |

**Multiple Choice Question:**

**Use the following information to answer questions 2-5.**

## Pond Ecosystem




The picture shows a pond ecosystem. Many plants and animals live in and around the pond.

2. One year the pond dried up.

   Which organism in the pond ecosystem was still able to take in oxygen?

   A. Turtle
   B. Trout
   C. Sunfish
   D. Tadpole

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 2

**Commentary:**

This multiple choice question asks students to identify which organism in a pond ecosystem would still be able to take in oxygen if the pond evaporated. Students must recall that organisms are adapted to their ecosystems and rely upon resources in their environment for survival. Students should recognize the organisms in a pond ecosystem (e.g., fish, turtle, duck) and know some of their basic needs and behaviors. Students should know that fish take in oxygen from the water using gills, and that in order take in oxygen from the atmosphere (air) an organism must have lungs. Answer choice A is correct because the only organism with lungs, among the choices given, is the turtle. If the pond dried up, the only organism that could still take in oxygen would be the turtle. Answer choices B, C and D are incorrect because the trout, sunfish and tadpole all use gills to take in oxygen from water and could not take in oxygen from the atmosphere if the pond dried up.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to recall the basic characteristics of organisms that live in a pond ecosystem and identify similarities and differences between groups of organisms. Students must know that animals with gills cannot take in oxygen in the absence of water, and that only animals with lungs can take in oxygen from the atmosphere.

**Performance Data:**

The percent of public school students selecting answer choice A for question 2 on the May 2007 Ohio Grade 5 Achievement Test for Science was 92%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 3**

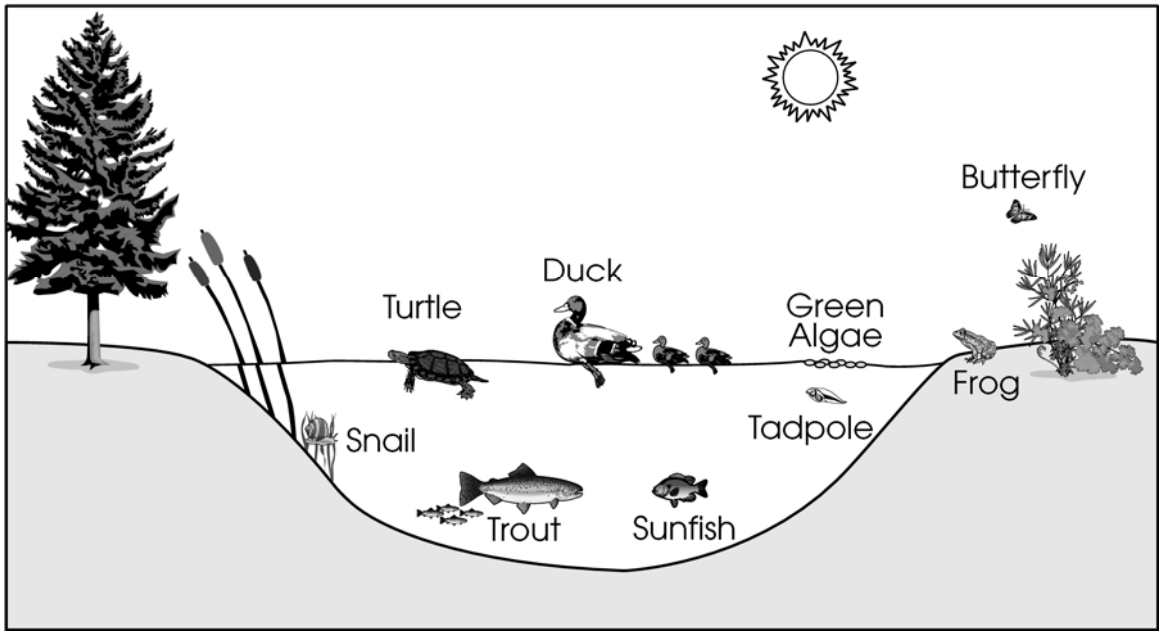
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | C. Compare changes in an organism's ecosystem/habitat that affect its survival. |
| GLI: | 5.LS.C.5<br>Support how an organism's patterns of behavior are related to the nature of that organism's ecosystem, including the kinds and numbers of other organisms present, the availability of food and resources, and the changing physical characteristics of the ecosystem. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | migration, pond ecosystem, characteristics of organisms |

**Multiple Choice Question:**

**Use the following information to answer questions 2-5.**

## Pond Ecosystem




The picture shows a pond ecosystem. Many plants and animals live in and around the pond.

3. In the winter, the pond starts to freeze. The ducks leave the pond. They migrate to warmer climates.

   Which statement explains one reason why ducks migrate?

   A. The ducks have too many enemies.
   B. The ducks have difficulty finding food.
   C. The ducks have to lay eggs near water.
   D. The ducks have too few places to hibernate.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 3

**Commentary:**

This multiple choice question asks students to identify one reason for why ducks migrate to warmer climates in the winter. Students must understand that ducks get their food by hunting and scavenging in the water. Students should recognize that when the pond freezes the ducks can no longer obtain food from the pond. Answer choice B is correct because the migration of ducks to warmer climates is due to the fact that they have difficulty finding food. Answer choice A is incorrect because ducks do not have more (enemies) predators in the winter than they do during the rest of the year. Answer choice C is incorrect because ducks do not migrate to warmer climates to lay their eggs. Ducks lay their eggs in the spring, after returning to the cooler climate. Answer choice D is incorrect because ducks do not hibernate.

This question is classified as Communicating Understanding / Analyzing Science Information because students must provide an explanation for an observation based on their knowledge of the life sciences and the characteristics of organisms.

**Performance Data:**

The percent of public school students selecting answer choice B for question 3 on the May 2007 Ohio Grade 5 Achievement Test for Science was 72%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 4**

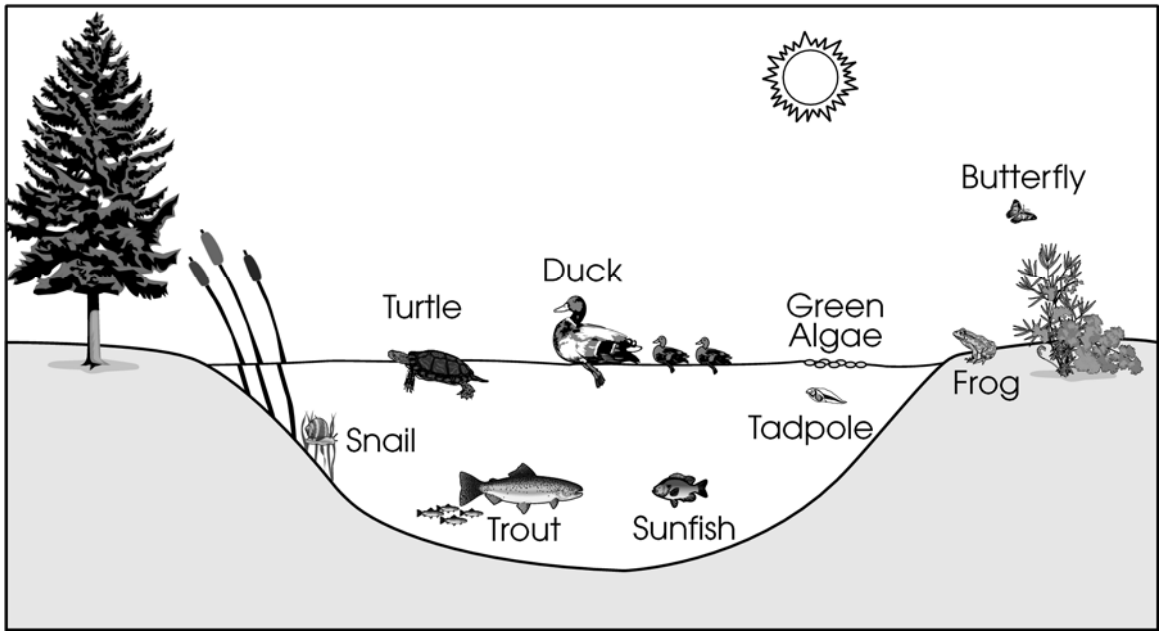
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive. |
| GLI: | 5.LS.B.1<br>Describe the role of producers in the transfer of energy entering ecosystems as sunlight to chemical energy through photosynthesis. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | pond ecosystem, photosynthesis, producer, consumer |

**Multiple Choice Question:**

**Use the following information to answer questions 2-5.**

## Pond Ecosystem




The picture shows a pond ecosystem. Many plants and animals live in and around the pond.

4. Look at the picture of the pond ecosystem.

   Which organism uses sunlight to produce food that others eat?

   A. Snail
   B. Sunfish
   C. Butterfly
   D. Green Algae

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 4

**Commentary:**

This multiple choice question asks students to identify the organism that uses sunlight to produce food that others eat. Students must recall that an organism that uses sunlight to produce food conducts photosynthesis and makes food for other organisms. Students should also recall that plants generally conduct photosynthesis, not animals. Answer choice D is correct because green algae are producers that use sunlight to make food. Other organisms in the pond ecosystem eat the green algae. Answer choice A is incorrect because a snail cannot use sunlight to make its own food since it cannot carry on photosynthesis. Answer choice B is incorrect because sunfish cannot use sunlight to make their own food through photosynthesis. Answer choice C is incorrect because butterflies are consumers and cannot use sunlight to make their own food. Butterflies eat nectar from the flowers of plants that are producers that use sunlight to make their own food.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to correctly recall which organisms are producers and which are consumers. Students also need to correctly identify green algae as a producer.

**Performance Data:**

The percent of public school students selecting answer choice D for question 4 on the May 2007 Ohio Grade 5 Achievement Test for Science was 79%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 5**

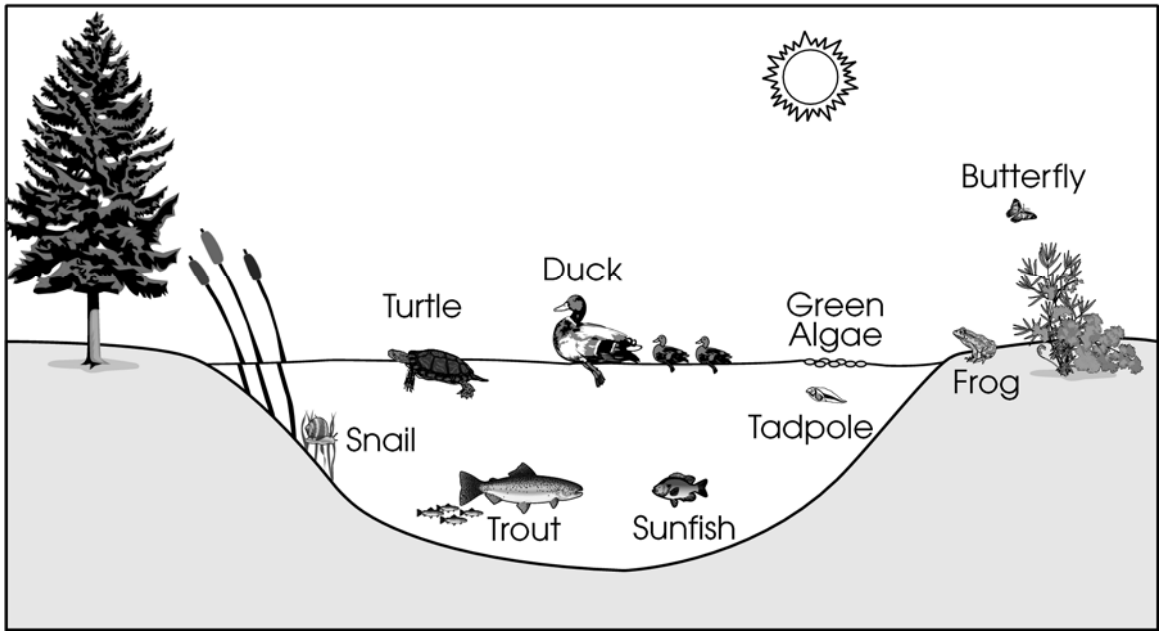
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | A. Differentiate between the life cycles of different plants and animals. |
| GLI: | 3.LS.A.1<br>Compare the life cycles of different animals including birth to adulthood, reproduction and death (e.g., egg-tadpole-frog, egg-caterpillar-chrysalis-butterfly). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | pond ecosystem, life cycles, butterfly metamorphosis |

**Multiple Choice Question:**

**Use the following information to answer questions 2-5.**

**Pond Ecosystem**




The picture shows a pond ecosystem. Many plants and animals live in and around the pond.

5. Which organism in the pond ecosystem completely changes its physical features and food source when it becomes an adult?

   A. Duck
   B. Turtle
   C. Trout
   D. Butterfly

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 5

**Commentary:**

This multiple choice question asks students to select the organism that completely changes its physical features and food source when it becomes an adult. Students must recall that what is being described is known as the process of called metamorphosis. Students should recall information regarding the life cycles of different plants and animals. Students should recognize that some organisms including the butterfly undergo metamorphosis during their life cycles. Answer choice D is correct because the butterfly undergoes a complete change in its physical features and food source during its lifecycle. Answer choice A is incorrect because the physical appearance and food source of a duck do not change during its lifecycle. A duckling and an adult duck are physically very similar and have the same dietary requirements. Answer choice B is incorrect because the physical appearance and food source of a turtle does not change during its lifecycle. Answer choice C is incorrect because the physical appearance and diet of a trout do not change significantly during its lifecycle.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to know and differentiate between the life cycles of different organisms.

**Performance Data:**

The percent of public school students selecting answer choice D for question 5 on the May 2007 Ohio Grade 5 Achievement Test for Science was 63%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 6**

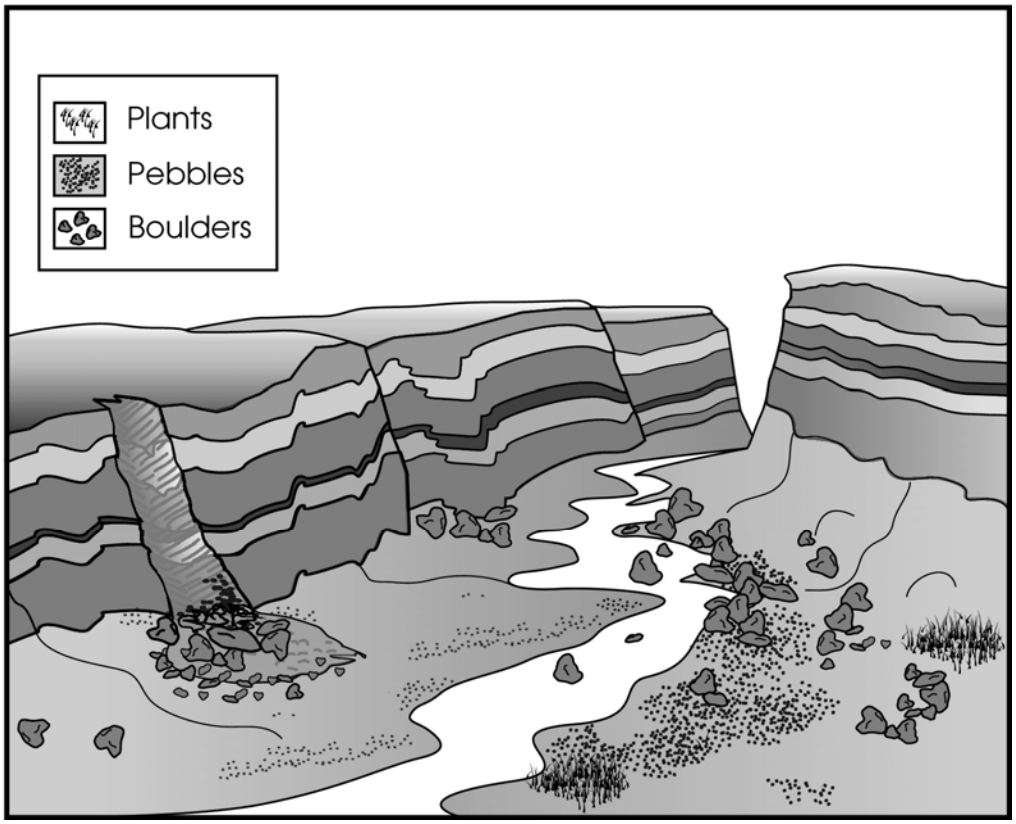
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | B. Summarize the processes that shape Earth's surface and describe evidence of those processes. |
| GLI: | 4.ES.B.10<br>Describe evidence of changes on Earth's surface in terms of slow processes (e.g., erosion, weathering, mountain building and deposition) and rapid processes (e.g. volcanic eruptions, earthquakes and landslides). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | identify, describe |
| Keywords: | erosion, weathering, land slide, mass wasting, canyon, deposition |

**Extended Response Question:**

**Use the information below to answer question 6.**

**Desert Canyon**




6. The picture shows a stream flowing through a desert canyon. The canyon was shaped by natural processes.

   In your **Answer Document**, identify a slow process that could have helped shape the canyon. Describe evidence of this process shown in the picture.

   Then, identify a rapid process that could have helped shape the canyon. Describe evidence of this process shown in the picture. (4 points)

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 6

**Commentary:**

This extended response question asks students to examine a diagram of a desert canyon and identify one slow process and one rapid process that could have helped shape the canyon and provided evidence of both of these processes from the diagram. Students must recall how the processes that shape Earth are both slow (e.g., erosion, weathering, deposition) and fast (e.g., earthquakes, landslides) and know what would provide evidence of these processes. Students should study the diagram to observe evidence of slow processes that may have helped to form the canyon such as erosion, wind and weathering. Students should recognize that evidence of erosion shown in the diagram includes the exposed face of the canyon wall and sand that is deposited along the river. Evidence of wind erosion can be seen in the rounded edges of the canyon. Students might note that evidence of weathering is illustrated by pebbles and sand and the bottom of slopes. Students should also observe evidence of rapid processes that may have helped to shape the canyon including landslides, earthquakes, volcanic eruptions, and seasonal floods. Evidence of landslides and earthquakes is illustrated by large rocks at the bottom of the cliff. Students might suggest that volcanic eruptions may be evidenced by dark layers in the exposed rock that could indicate an eruption at some point in history or that evidence of seasonal floods can be seen in the deposition or large rocks found at the base of the cliffs. The response that earns full credit correctly identifies one slow process that helped shape the canyon and describes evidence of the process and also correctly identifies one rapid process that helped shape the canyon and describes evidence of this process.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students' to combine accurate observations with valid inferences about evidence presented in a diagram of a desert canyon. Students must apply their understanding of Earth processes to suggest natural processes by which the canyon was changed over time.

**Performance Data:**

The percent of public school students earning each score point for question 6 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |
| 40% | 33% | 16% | 9% | 2% |

**Sample Response for Item 6 (Extended Response):**

**Exemplar Response:**
One slow natural process is the constant erosion of the canyon by water and wind. Evidence of this process is the exposed face of the canyon wall. One rapid process is the landslide. The evidence for the landslide is the large rocks along the bottom of the cliffs.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 6**

**Other Correct Response(s):**
Acceptable slow processes include:

- Erosion, exposed rock layers on cliff faces or canyon walls.
- Erosion, evidenced by sand deposited along the river.
- Weathering of rocks (by wind or water), evidenced by rocks breaking down to smaller rocks. This could be interpreted from the pebbles and sand at the bottom of the slopes.
- Wind, evidenced by rounded off edges of canyon surface.

Acceptable fast processes include:
- Landslides (mudslides, rockslides) evidenced by large rocks at the bottom of the cliff.
- Volcanic eruptions evidenced by the dark layers which could indicate a volcanic ash.
- Earthquake could have caused the rocks to fall off the cliffs.
- Seasonal floods, which may have altered the river as evidenced by deposition or large rocks at the base of the cliffs.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 4 point | The response provides the correct identification of one slow process AND one rapid process that have shaped the canyon AND a correct description of evidence from the picture of the action of both processes. |
| 3 point | The response provides the correct identification of one slow process AND one rapid process that have shaped the canyon AND a correct description of evidence from the picture of the action of one of the processes. |
| | 3 point sample answer:<br>There was a landslide, which was a fast process. The large rocks at the bottom of the cliffs are evidence that a landslide occurred. Erosion caused by the river was a slow process. |
| 2 point | The response provides the correct identification of one slow process and one rapid process that have shaped the canyon<br>OR<br>a correct identification of one process and a correct description of evidence from the picture of the action of this process. |
| | 2 point sample answer:<br>The landslide was a fast process. You can tell a landslide occurred because of the pile of boulders at the base of the cliff. |
| 1 point | The response provides the correct identification of one slow process<br>OR<br>one rapid process that have shaped the canyon. |
| | 1 point sample answer:<br>A slow process is erosion as evidenced by the canyon walls. |
| 0 point | The response fails to demonstrate any understanding of the processes that formed the canyon. 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 very 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.” |
| | 0 point sample answer:<br>The canyon with its many layers was shaped by natural processes. |

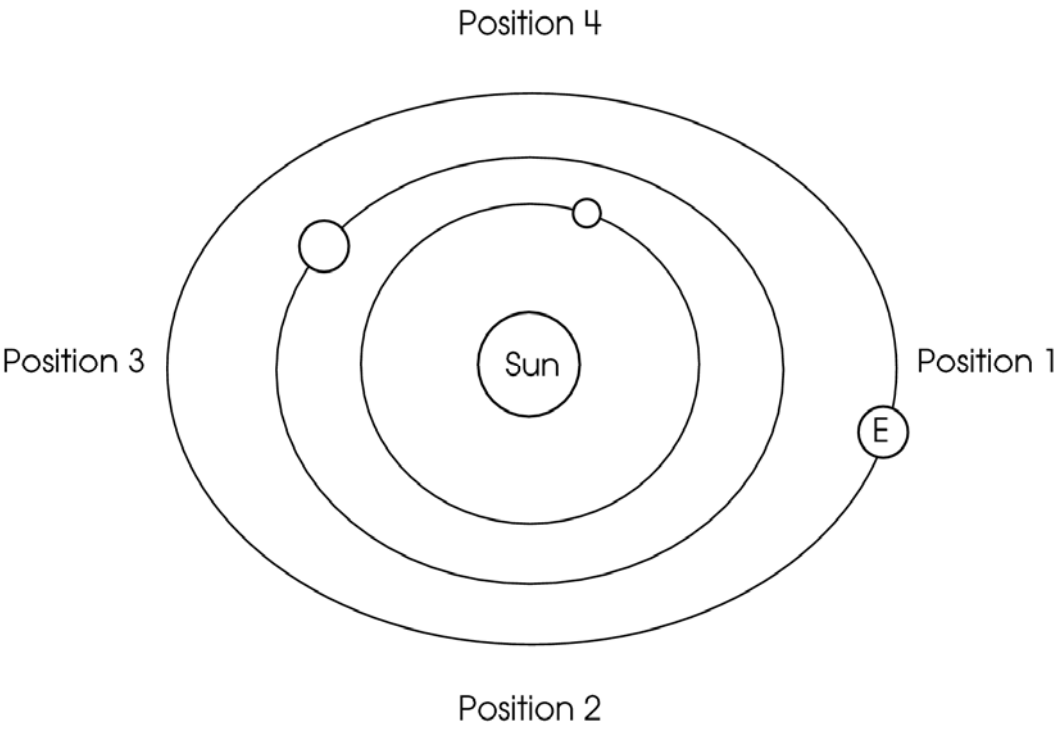
**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 7**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system. |
| GLI: | 5.ES.A.2<br>Explain that Earth is one of several planets to orbit the sun, and that the moon orbits Earth. |
| Level: | Communicating Understanding / Analyzing Science |
| Power Words: | |
| Keywords: | orbit, solar system, Earth, sun |

**Multiple Choice Question:**

The diagram shows the position of Earth (E) now.




7. Where will Earth be in six months?

   A. near position 1
   B. near position 2
   C. near position 3
   D. near position 4

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 7

**Commentary:**

This multiple choice question asks students to use a diagram to predict where the Earth will be positioned in its orbit around the sun after a given amount of time. Students must understand the cycles and patterns that involve Earth and its place in the solar system including that Earth orbits the sun in a predictable way. Students must recall that Earth travels around the sun once every 12 months in a counter-clockwise direction and that this determines the length of a year on Earth. Students should observe the diagram and recognize that in six months, Earth will travel halfway around the sun from its current location near position 1 to its new location near position 3. Answer choice C is correct because Earth will be near position 3 in six months since it is shown currently near position 1. Answer choice A is incorrect because position 1 is the starting position and Earth will move from this location during six months. Answer choice B is incorrect because position 2 is three-quarters of the way around the sun so it would take Earth 9 months,, not 6 months, to travel to position 2. Answer choice D is incorrect because position 4 is one-quarter of the way around the sun so it would take Earth only 3 months to travel to position 4.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to examine a diagram and recall information about the position and motion of Earth in its orbit. Students must apply their knowledge about how Earth moves around the Sun in its orbit and understand the definition of a year to accurately respond to this task.

**Performance Data:**

The percent of public school students selecting answer choice C for question 7 on the May 2007 Ohio Grade 5 Achievement Test for Science was 60%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 8

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Science and Technology |
| Benchmark: | B. Describe and illustrate the design process. |
| GLI: | 3.ST.B.4<br>Use a simple design process to solve a problem (e.g., identify a problem, identify possible solutions and design a solution). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | design, solution, design problem, test |

**Multiple Choice Question:**

8. Which is the first step in a design process?

   A. Revise the solution.
   B. Describe the problem.
   C. Test the possible solutions.
   D. Identify possible solutions.

**Commentary:**

This multiple choice question asks students to identify the first step of the design process. Students must recall that the design process is a systematic problem-solving strategy which involves identifying a problem, identifying possible solutions, designing a solution and evaluating the model solution to suggest ways to make it work better. Answer choice B is correct because describing the problem is the first step in the design process. Answer choice A is incorrect because revising follows testing possible solutions and is likely to be the last step in the process. Answer choice C is incorrect because the possible solutions must be identified before they can be tested so testing the possible solutions cannot be the first step. Answer choice D is incorrect because one cannot identify possible solutions until a problem is identified and described.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to know the steps of the design process.

**Performance Data:**

The percent of public school students selecting answer choice B for question 8 on the May 2007 Ohio Grade 5 Achievement Test for Science was 51%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 9

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | A. Compare the characteristics of simple physical and chemical changes. |
| GLI: | 4.PS.A.1<br>Identify characteristics of a simple physical change (e.g., heating or cooling can change water from one state to another and the change is reversible). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | describes |
| Keywords: | physical changes, chemical changes, chemical composition |

**Multiple Choice Question:**

9. Sharpening a pencil and tearing paper are examples of physical changes.

   Which statement describes why these are physical changes?

   A. There is a change in how the objects are used.
   B. There is a change in the appearance of the objects.
   C. There is a change in the materials from which the objects are made.
   D. There is a change in both the appearance of the objects and the materials from which they are made.

**Commentary:**

This multiple choice question asks students to identify why sharpening a pencil and tearing paper are examples of physical changes. Students must recall that in a physical change, physical properties such as the size and shape of an object may change, but the material from which the object is made does not change. Students should also recall that a chemical change alters an object's chemical composition and a new material is made. Students should recognize that in this scenario, the pencil and paper do not undergo a chemical change because the materials of which they are made do not change. Answer choice B is correct because a change in appearance explains why these changes are physical changes. Answer choice A is incorrect because a change in use may be a result of a physical or a chemical change so this would not provide evidence of only a physical change. Answer choice C is incorrect because a change in the materials from which objects are made describes a chemical change, not a physical change. Answer choice D is incorrect because a change in both the appearance and the materials from which an object is made describes both a chemical and a physical change.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to correctly recall the differences between physical and chemical changes and identify examples of physical change.

**Performance Data:**

The percent of public school students selecting answer choice B for question 9 on the May 2007 Ohio Grade 5 Achievement Test for Science was 59%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 10**

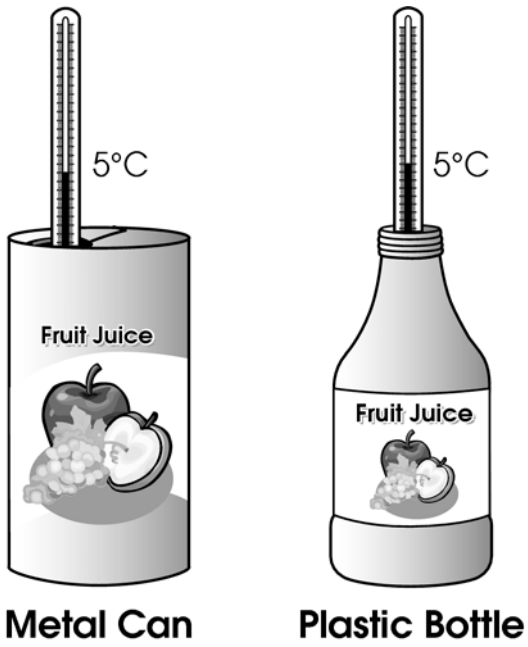
**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | B. Identify and describe the physical properties of matter in its various states. |
| GLI: | 4.PS.B.3<br>Describe objects by the properties of the materials from which they are made and that these properties can be used to separate or sort a group of objects (e.g., paper, glass, plastic and metal). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | physical properties, conductor, thermal energy, conductivity |

**Multiple Choice Question:**

**Use the following information to answer question 10.**

10. Two juice containers are in a cooler. One is plastic and one is metal. The metal can feels colder than the plastic bottle. Students place a thermometer in each container. They find that the juices in the bottle and in the can are the same temperature.




Why does the can feel colder than the bottle?

A. The metal can holds colder juice than the plastic bottle.
B. Plastic is a better conductor of thermal energy than metal.
C. Metal is a better conductor of thermal energy than plastic.
D. The outside of the metal can is drier than the plastic bottle.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 10

**Commentary:**

This multiple choice question asks students to identify why a metal can feels colder than a plastic bottle that contains a liquid at the same temperature. Students must recall that the characteristics of objects, such as these juice containers, are determined by the materials from which they are made. Students must also recall that metal is a better conductor of thermal energy than is plastic. Students are told that the temperature of the juice in each container is $5^{o}C$ but that the metal container feels cooler to the touch than the plastic. Students should recognize that the metal can will transfer thermal energy from the hand to the juice more quickly than will the plastic bottle. Answer choice C is correct because metal is a better conductor than plastic resulting in the metal can feeling colder to the touch than the plastic bottle. Answer choice A is incorrect because the juice in both containers is at the same temperature, one is not colder than the other. Answer choice B is incorrect because plastic is not a better conductor of thermal energy than metal. Answer choice D is incorrect because there is no evidence that condensation has formed on either the can or bottle to support this conclusion. While water may condense on the outside of containers when they are moved from a colder to warmer environment, more condensation would occur on the material that is the better conductor (feels colder) of thermal energy (the metal can).

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to demonstrate an understanding of how the materials from which objects are made determine their characteristic properties such as conductivity.

**Performance Data:**

The percent of public school students selecting answer choice C for question 10 on the May 2007 Ohio Grade 5 Achievement Test for Science was 54%.

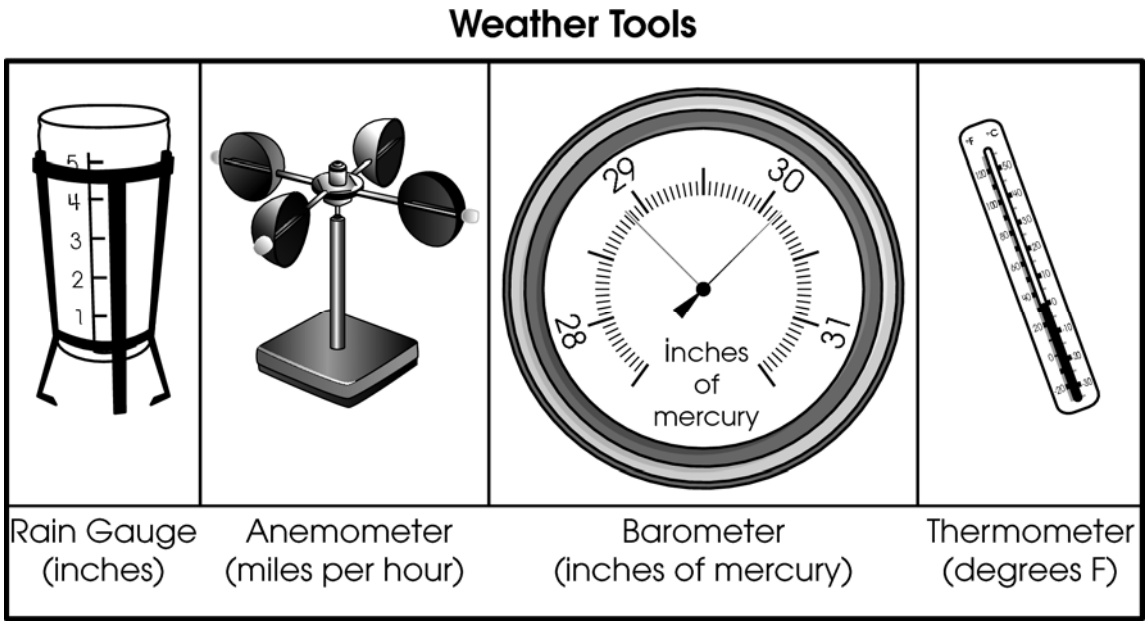
**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 11**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Inquiry |
| Benchmark: | A. Use appropriate instruments safely to observe measure and collect data when conducting a scientific investigation. |
| GLI: | 5.SI.A.1<br>Select and safely use the appropriate tools to collect data when conducting investigations and communicating findings to others (e.g., thermometers, timers, balances, spring scales, magnifiers, microscopes and other appropriate tools). |
| Level: | Demonstrating Investigation Processes of Science |
| Power Words: | describe, explain |
| Keywords: | weather, tools, thermometer, anemometer, rain gauge, barometer |

**Extended Response Question:**

11. Students plan to set up a simple weather station. They have the tools shown to collect weather data.




In your **Answer Document**, describe where two of these tools should be located to obtain accurate measures.

Explain why each location is important. (4 points)

**Commentary:**

This extended response question asks students to describe where two weather tools for a weather station should be located and explain why their locations are important to obtaining

accurate measurements. Students are provided a description and diagram of four weather tools (rain gauge, anemometer, barometer, and thermometer) and must select two to discuss. Once the tools have been selected the student must describe where each tool should be placed for accurate measures to be taken and explain why the placement of each tool is important. Students must recall what each tool measures and make inferences about appropriate locations for each tool. Students may select the thermometer (used to measure temperature) and suggest that it should be placed outdoors but not in direct sunlight. Students may recall that if the thermometer receives direct sunlight it may result in temperature readings that are higher than the ambient (air) temperature. Students may select the rain gauge (used to measure rain fall) and suggest that it should be placed in an open area so that it can collect rainwater as it falls without obstruction. Students should recognize that if the rain gauge is blocked by a building or other structure, it could prevent rain from being captured and then the measurements would not reflect actual rainfall amounts. The response that earns full credit selects two weather tools from those listed and correctly explains where each should be located and why the location of each tool is important to obtain accurate measures.

This question is classified as Demonstrating Investigation Processes of Science because the task requires students to demonstrate proper use and placement of scientific tools by describing how two different weather tools are used to measure weather properties.

**Performance Data:**

The percent of public school students earning each score point for question 11 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |
| 35% | 26% | 29% | 6% | 3% |

**Sample Response for Item 11 (Extended Response):**

**Exemplar Response:**
The anemometer works when wind blows into the cups. It needs to be outside, on a pole or on top of the building where wind can hit it. The rain gauge collects rain water. It must be placed outside in the open where rain can reach it.

**Other Correct Response(s):**
Acceptable responses include:
Anemometer:

- An anemometer must be placed outside where the wind can reach it. Accurate measurements depend upon placement of the anemometer in the open; an anemometer must be placed away from buildings and trees that could block the wind.

Barometer:

- A barometer can be used inside or outside buildings. Having the instrument in the

classroom makes it easy for students to read.

Rain gauge:

- A rain gauge must be placed outside so that it can collect rainwater as it falls. In order to get an accurate measurement it must be placed away from buildings or anything else that would prevent the rain from falling into the gauge.

Thermometer:

- Thermometers are placed outside to measure temperature for weather. They need to be placed where the sun does not shine directly on them because this would result in higher than actual temperature readings.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 4 point | The response provides correct descriptions of where two instruments must be located to collect weather data AND explains why each location is important to accurately collect weather data. |
| 3 point | The response provides correct descriptions of where two instruments must be located to collect weather data and explains why the location is important for the accurate collection of data by one of the instruments<br>OR<br>a correct description of where one instrument must be located to collect weather data and explains why the location is important for the accurate collection of data by two of the instruments. |
| | 3 point sample answer:<br>The rain gauge collects rain water so it must be placed outside. The thermometer needs to be placed outside, but away from places that are always in the deep shade or direct sun. Placing the thermometer in the sun would make it record a higher than actual temperature. |
| 2 point | The response provides correct descriptions of where two instruments must be located to collect weather data<br>OR<br>explains why the location of two instruments is important to accurately collect weather data (without providing descriptions of the actual locations)<br>OR<br>a correct description of where one instrument must be located to collect weather data and explains why the location is important for the accurate collection of data by the instrument. |
| | 2 point sample answer:<br>The rain gauge collects rain water so needs to be placed outside away from buildings where it receives direct rain fall. |

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 11**

| | |
|---|---|
| 1 point | The response provides a correct description of where one instrument must be located to collect weather data<br>OR<br>explains why the instrument's location is important to accurately collect weather data. |
| | 1 point sample answer:<br>An anemometer must be placed outside in the open.<br>OR<br>The rain gauge must be placed outside away from buildings or trees. |
| 0 point | The response fails to demonstrate any understanding of the importance of location for a weather tool to accurately collect data. 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 very 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.” |
| | 0 point sample answer:<br>A rain gauge is used to measure rainfall. |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 12

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | C. Describe the forces that directly affect objects and their motion. |
| GLI: | 3.PS.C.4<br>Predict the changes when an object experiences a force (e.g., a push or pull, weight and friction). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | force, mass, gravity, weight, friction, contact |

**Multiple Choice Question:**

12. A student places a ball on the ground and kicks it. The ball moves along the ground.

    Why does the ball move?

    A. The kick decreases the weight of the ball.
    B. The kick applies a contact force to the ball.
    C. The kick decreases the force of gravity acting on the ball.
    D. The kick removes friction between the ball and the ground.

**Commentary:**

This multiple choice question asks students to explain why a ball moves along the ground after it is kicked. Students must recall that when an object (the ball) is at rest balanced forces are acting on it; the force of gravity pulls the ball toward the center of Earth and the ground pushes back on the ball. These forces keep the ball stationary. Students should recognize that when the student kicks the ball, another force is applied to the ball and the forces are no longer balanced. When an object is acted on by unbalanced forces, it will experience a change in its motion (speed and/or direction). Answer choice B is correct because the contact force provided by the kick causes the ball to move. Answer choice A is incorrect because kicking the ball does not change the weight of the ball. As long as the ball stays on Earth and remains unchanged, its weight will not change. Answer choice C is incorrect because the force of gravity on the ball is not changed by the kick. The force of gravity on the ball will not change unless the ball is moved further away from the center of Earth or its mass changes. Answer choice D is incorrect because the friction between the ground and the ball cannot be removed by the kick. Friction is a force that opposes motion and eventually it will slow and stop the motion of the ball. Friction does not cause motion. Frictional force depends on both the object's weight and the properties of the materials from which it is made.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to identify that a force must be applied in order for an object to move. Students must also recognize which force causes the motion of the ball in the given scenario.

**Performance Data:**

The percent of public school students selecting answer choice B for question 12 on the May 2007 Ohio Grade 5 Achievement Test for Science was 73%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 14**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | A. Differentiate between the life cycles of different plants and animals. |
| GLI: | 4.LS.A.5<br>Describe how organisms interact with one another in various ways (e.g., many plants depend on animals for carrying pollen or dispersing seeds). |
| Level: | Communicating Understanding/Analyzing Scientific Information |
| Power Words: | |
| Keywords: | life cycles, plants, seeds |

**Multiple Choice Question:**

14. Which seed has structures that allow animals to transport the seed on their fur?

A. Corn Seed

B. Cocklebur

C. Maple Seed

D. Acorn

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 14

**Commentary:**

This multiple choice question asks students to select the seed that has structures that enable it to be transported by animals on their fur. Students are provided pictures of four seeds. Students must observe and evaluate the structures of the corn seed, cocklebur, maple seed and acorn. Students will observe that the cocklebur seed is covered with spines while the corn seed and the acorn are round and smooth, and the maple seed is long and relatively smooth. Answer choice B is correct because the cocklebur could be transported on the fur of an animal since its spines would stick to the fur. Answer choice A is incorrect because a corn seed is smooth and will not stick to an animal's fur. Answer choice C is incorrect because the maple seed is thin, light and will not easily stick to an animal's fur. Animal choice D is incorrect because acorns are large, heavy and smooth and do not stick to an animal's fur.

This question is classified as Communicating Understanding/Analyzing Scientific Information because the task requires students to evaluate the structures of seeds and determine which one is likely to be distributed by sticking to the fur of animals.

**Performance Data:**

The percent of public school students selecting answer choice B for question 14 on the May 2007 Ohio Grade 5 Achievement Test for Science was 85%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 15

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system. |
| GLI: | 5.ES.A.3<br>Describe the characteristics of Earth and its orbit about the sun (e.g., three-fourths of Earth's surface is covered by a layer of water [some of it frozen], the entire planet surrounded by a thin blanket of air, elliptical orbit, tilted axis and spherical planet). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | day, night, Earth's rotation, patterns |

**Multiple Choice Question:**

15. A class was learning about the pattern of day and night on Earth.

    What part of Earth experiences night at the same time?

    A. less than ¼

    B. about ½

    C. about ¾

    D. almost all

**Commentary:**

This multiple choice question asks students to identify what portion of Earth experiences night at the same time. Students must know the characteristics, cycles and patterns about Earth and its place in the solar system including that Earth is always rotating on its axis causing day and night. Students must know that the shape of Earth is nearly spherical, so only one half of Earth faces toward the sun at any time. Students should recognize that the half of Earth that faces toward the sun experiences day while the half of Earth that faces away from the sun experiences night. Answer choice B is correct because about ½ (half) of Earth experiences night at the same time. Answer choice A is incorrect because if less than ¼ of Earth experienced night at the same time, then when the sun rose in New York, it would set in Hawaii. Answer choice C is incorrect because if ¾ of Earth experienced night at the same time, when the sun rose in New York, it set in London. Answer choice D is incorrect because if almost all of Earth experienced night at the same time, the sun would never rise.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to correctly recall information about Earth and its place in the solar system including that half of the Earth experiences night at the same time.

**Performance Data:**

The percent of public school students selecting answer choice B for question 15 on the May 2007 Ohio Grade 5 Achievement Test for Science was 67%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 16**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Ways of Knowing |
| Benchmark: | C. Explain the importance of keeping records of observations and investigations that are accurate and understandable. |
| GLI: | 4.SK.C.4<br>Explain why keeping records of observations and investigations is important. |
| Level: | Demonstrating Investigation Processes of Science |
| Power Words: | explain |
| Keywords: | recording data, records, observations, investigations, accurate |

**Short Answer Question:**

16. A teacher demonstrates how ice changes states. Two students record how long it takes for ice to change to steam, as shown.

3, 10, 27, 45, 57, 100

**Student 1**

| Time (minutes) | Temperature (°C) |
|---|---|
| 1 | 3 |
| 2 | 10 |
| 3 | 27 |
| 4 | 45 |
| 5 | 57 |
| 6 | 100 |

**Student 2**

In your **Answer Document**, explain why student 2's record is more understandable than student 1's record.

Then, explain why accurate and understandable records are important. (2 points)

**Commentary:**

This short answer question asks students to evaluate the data recorded by two students during an investigation. Students must read and interpret the provided information and evaluate the ways in which student 1 and student 2 organized and presented their data. Students must explain why one set of data is more understandable than the other and why accurate and understandable records are important. Students will observe that student 1 wrote a series of numbers with no explanation or data labels. Students should recognize that there is no way to determine what the numbers represent. Students should further note that student 2 developed a table with columns that are clearly labeled (i.e., time in minutes and temperature in $^{o}$C). Students should realize that it would be clear to anyone who reads the data what the numbers represent in the data table constructed by student 2. Students should also state that good

record keeping is important so that information is clearly communicated to others. When the investigation is repeated, understandable data must be available for analysis and comparison. The response that earns full credit correctly identifies why student 2's data record is more understandable and explains why accurate and understandable records are important to science.

This question is classified as Demonstrating Investigation Processes of Science because the task requires students to evaluate and explain procedures and methods of science and provide evidence to support a conclusion regarding the presentation of data.

**Performance Data:**

The percent of public school students earning each score point for question 16 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | |
|---|---|---|
| 0 | 1 | 2 |
| 34% | 46% | 20% |

**Sample Response for Item 16 (Short Answer):**

**Exemplar Response:**
Student 1 only wrote down numbers. There is no way to know what the numbers mean. You have to have good records so you can describe the observations and measurements made during the experiment.

**Other Correct Response(s):**
Possible explanations of why student 1's records are not as easy to understand/are not as informative as the records kept by student 2:

- Student 1 only wrote down the numbers and without the units there is no way to know what the numbers mean.
- Student 1 did not record the scale used for temperature.
- Student 1 did not state the times when the temperatures were taken.
- Recording temperature without recording the times does not communicate the rate at which the temperature changed.

Possible explanations of why understandable records are important:

- Students need understandable data so that they can compare observations and measurements, make conclusions, or replicate the experiment.
- Without labels, students may not understand what the numbers mean when they look at them on another day.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 2 point | The response provides an explanation of why student 1's |

| | |
|---|---|
| | records are not as easy to understand as are the records kept by student 2 or an explanation of why the records kept by student 2 are easier to understand AND provides an explanation of the importance of recording data in an accurate and understandable manner. |
| 1 point | The response provides an explanation of why student 1's records are not as easy to understand as are the records kept by student 2<br>OR<br>an explanation of why the records kept by student 2 are easier to understand<br>OR<br>provides an explanation of the importance of recording data in an accurate and understandable manner. |
| | 1 point sample answer:<br>Without labels, students may not understand what the numbers mean when they look at them on another day. |
| 0 point | The response fails to demonstrate any understanding of the importance of keeping accurate and understandable records. 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 very 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.” |
| | 0 point sample answer:<br>It is important to keep accurate and understandable records. Student 2 kept more understandable records than student 1. |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 23

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system. |
| GLI: | 5.ES.A.3<br>Describe the characteristics of Earth and its orbit about the sun (e.g., three-fourths of Earth's surface is covered by a layer of water [some of it frozen], the entire planet surrounded by a thin blanket of air, elliptical orbit, tilted axis and spherical planet). |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | Earth, Earth's surface, ocean, maps |

**Multiple Choice Question:**

23. About how much of Earth's surface is covered by oceans?

    A. less than 20%
    B. about 50%
    C. about 70%
    D. more than 90%

**Commentary:**

This multiple choice question asks students to identify how much of Earth's surface is covered by the ocean. Students must know some characteristics, cycles and patterns of Earth. Students must recall from maps and models of Earth that approximately 70% of Earth's surface is covered by a layer of water. Answer choice C is correct because it states that 70% of Earth's surface if covered by ocean. Answer choices A, B and D are incorrect because the ocean covers about 70% of the Earth's surface, not less than 20%, about 50% or more than 90%.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to correctly recall information about Earth and its place in the solar system including that about 70% of the Earth's surface is covered by water.

**Performance Data:**

The percent of public school students selecting answer choice C for question 23 on the May 2007 Ohio Grade 5 Achievement Test for Science was 70%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 24

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | C. Compare changes in an organism's ecosystem/habitat that affect its survival. |
| GLI: | 5.LS.C.4<br>Summarize that organisms can survive only in ecosystems in which their needs can be met (e.g., food, water, shelter, air, carrying capacity and waste disposal). The world has different ecosystems and distinct ecosystems support the lives of different types of organisms. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | ecosystem, survival, decomposers, soil nutrients |

**Multiple Choice Question:**

24. In a forest, how do decomposers help other organisms survive?

A. They release oxygen into the air that animals breathe.
B. They put nutrients into the soil that plants use to grow.
C. They provide shelter in forests where animals can hide.
D. They use sunlight to make food for plants and animals.

**Commentary:**

This multiple choice question asks students to describe how decomposers in a forest help other organisms survive. Students must recall that decomposers break down dead material (plants, animals, and their wastes) and return nutrients in these organic materials to the environment. Decomposers that live in forests (like fungi) are mostly located in or near the soil, so the nutrients they release from the dead materials are deposited primarily into the soil. Answer choice B is correct because decomposers put nutrients into the soil and plants use these nutrients for growth. Answer choice A is incorrect because decomposers do not release oxygen into the air through the process of photosynthesis as plants do. Answer choice C is incorrect because since most decomposers live in or near the soil, they are not properly located to provide shelter for most animals. Plants in a forest may provide shelter for animals. Answer choice D is incorrect because decomposers do not rely directly on sunlight for energy because they do not carry on photosynthesis. Decomposers release energy in the process of breaking down dead organic material.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to correctly recall the role of decomposers in the environment. Students must also understand the specific role decomposers play in a forest ecosystem.

**Performance Data:**

The percent of public school students selecting answer choice B for question 24 on the May 2007 Ohio Grade 5 Achievement Test for Science was 65%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 26

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Ways of Knowing |
| Benchmark: | A. Distinguish between fact and opinion and explain how ideas and conclusions change as new knowledge is gained. |
| GLI: | 4.SK.A.1<br>Differentiate fact from opinion and explain that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | fact, opinion, Amber, statement, inference |

**Multiple Choice Question:**

26. Millions of years ago, the insect shown was trapped in sticky tree sap. The dried tree sap is now called amber. Amber looks like a clear gold or brown stone.

Which statement is an opinion about the amber?

A. Amber is made of hardened tree sap.
B. Ancient insects can be found in amber.
C. Amber was formed millions of years ago.
D. All insects prefer tree sap as a food source.

**Commentary:**

This multiple choice question asks students to identify a statement about an amber sample which represents an opinion and is not a fact. Students must understand the difference between a fact and an opinion and evaluate each statement to determine which represents an opinion rather than a scientific fact. In this question, only one insect is observed and discussed. There are no data to support the preferred food source of insects. Answer choice D is correct because there is no evidence that all insects prefer tree sap as a food source, so this statement

is based on opinion. Answer choice A is incorrect because according to the passage, amber is made of hardened tree sap so this statement is a given fact. Answer choice B is incorrect because according to the passage and diagram, ancient insects can be found in amber. Answer choice C is incorrect because according to the passage, amber was formed millions of years ago so this is a given fact.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to distinguish between statements that represent fact and those which represent opinion in a given scientific scenario.

**Performance Data:**

The percent of public school students selecting answer choice D for question 26 on the May 2007 Ohio Grade 5 Achievement Test for Science was 72%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 27**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | F. Describe the properties of light and sound energy. |
| GLI: | 5.PS.F.6<br>Describe and summarize observations of the transmission, reflection, and absorption of sound. |
| Level: | Applying Concepts / Making Relevant Connections with Science |
| Power Words: | explain, describe |
| Keywords: | sound, sound energy, sound waves, vibrations, sound transfer |

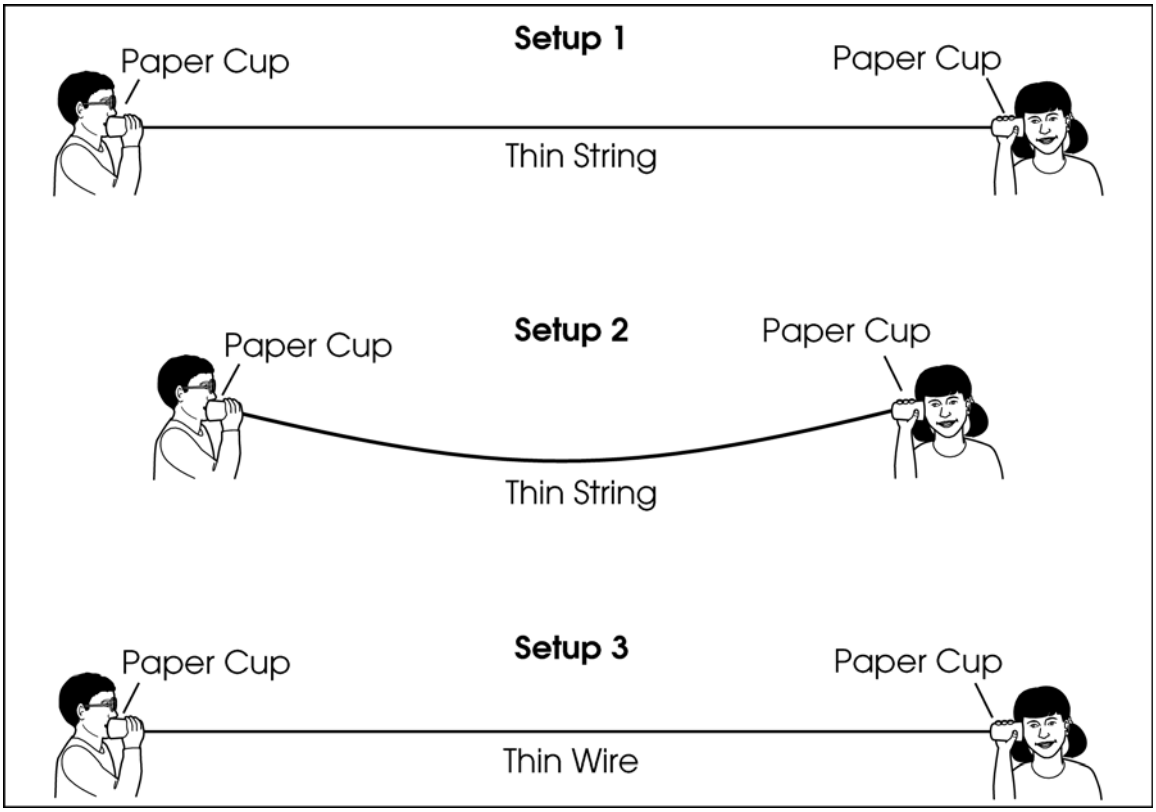
**Short Answer Question:**

**Use the following investigation to answer questions 27-31.**

**Model Telephone**

Two students want to find out what affects the sounds heard through model telephones. They investigate the materials used and the tightness of the material connecting the cups.

Their first three setups are shown. They use the same length of string or wire in each setup. The boy repeats the same sounds at the same volume for each setup.



They record results of the three setups in the table below.

**Model Telephone Investigation**

| Setup | Description of Sound Heard |
|---|---|
| 1 | Sound is Muffled |
| 2 | No Sound is Heard |
| 3 | Sound is Clear |

27. Look at the picture and the table for the Model Telephone Investigation.

In your **Answer Document**, explain why the sound was heard in setup 1.

Then, describe what happened to the sound energy in setup 2. (2 points)

**Commentary:**

This short answer question asks students to explain why sound could be heard or not heard in a Model Telephone Investigation. Students must examine the diagrams showing three setups for the investigation and a data chart that describes what happened in each setup. Students are asked to explain the results of setup 1 and setup 2. Students should observe that in setup 1, two students have a thin, tight string is stretched between two paper cups and are told that a muffled sound is heard. Students also observe that in setup 2, two students have a loose, thin string attached to two paper cups and the data table states that no sound is heard. Students must understand that sound travels in waves that require a medium through which to travel. Students should recognize that for sound to be heard the sound waves must be transmitted from one point to another (from one cup to the other through the string). Students should explain that the sound was heard in setup 1 because the string was tight and vibrations (sound energy) were transmitted from one student's cup to the other. The sound waves traveled along the string. Students must also explain that the loose string in setup 2 absorbed the sound energy and because its energy (the vibration) was lost the sound could not be heard by the other student.

This question is classified as Applying Concepts / Making Relevant Connections with Science because the task requires students to apply their knowledge of how sound waves are generated and how sound energy is transmitted to this investigative scenario. Students must also make observations and relate their observations to wave transmission and identify scientific evidence to explain the results of the Model Telephone Investigation.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 27

**Performance Data:**

The percent of public school students earning each score point for question 27 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | |
|---|---|---|
| 0 | 1 | 2 |
| 74 | 13% | 13% |

**Sample Response for Item 27 (Short Answer):**

**Exemplar Response:**
The sound was heard in Set-up 1 because the string was tight and vibrated. The string was loose in Set-up 2. Sound energy was absorbed by the string in Set-up 2 because it couldn't vibrate.

**Other Correct Response(s):**
Acceptable explanations of why the sound was heard in setup 1:

- The sound was heard in Set-up 1 because the string was tight and vibrated.
- The string was stretched tight in Set-up 1, but not in Set-up 2. The string must be tight enough to vibrate in order to transmit sound.
- Sound waves could travel on the tight string in Set-up 1.

Acceptable descriptions of what happened to the sound energy in setup 2:

- The string was loose in Set-up 2. Sound energy was absorbed by the string in Set-up 2 because it couldn't vibrate.
- The sound energy was absorbed by the loose line in Set-up 2.
- The string in Set-up 2 was too loose to vibrate and carry the sound waves.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 2 point | The response shows an understanding of how sound travels by explaining that "sound waves" moving or the "vibrating" string transferring the sound in Set-up 1 but not in Set-up 2 AND provides a description of how the sound energy was absorbed by the loose string in Set-up 2. |
| 1 point | The response explains why sound was transmitted in Set-up 1 but not in Set-up 2.<br>OR<br>The response explains what happened to the sound energy in Set-up 2. |
| | 1 point sample answer:<br>The sound was heard in Set-up 1 because the string was tight and vibrated, so the sound was transferred. |
| 0 point | Response does not demonstrate any understanding that sound |

| | |
|---|---|
| | is transmitted by vibrations. 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 very 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.” |
| | 0 point sample answer:<br>Sound was heard in Set-up 1 but not in Set-up 2. |

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 28**

**Standard and Benchmark Assessed:**

Standard: Physical Sciences
Benchmark: F. Describe the properties of light and sound energy.
GLI: 5.PS.F.6
Describe and summarize observations of the transmission, reflection, and absorption of sound.
Level: Communicating Understanding / Analyzing Science Information
Power Words: explains
Keywords: sound transmission, sound waves, sound energy, sound generation

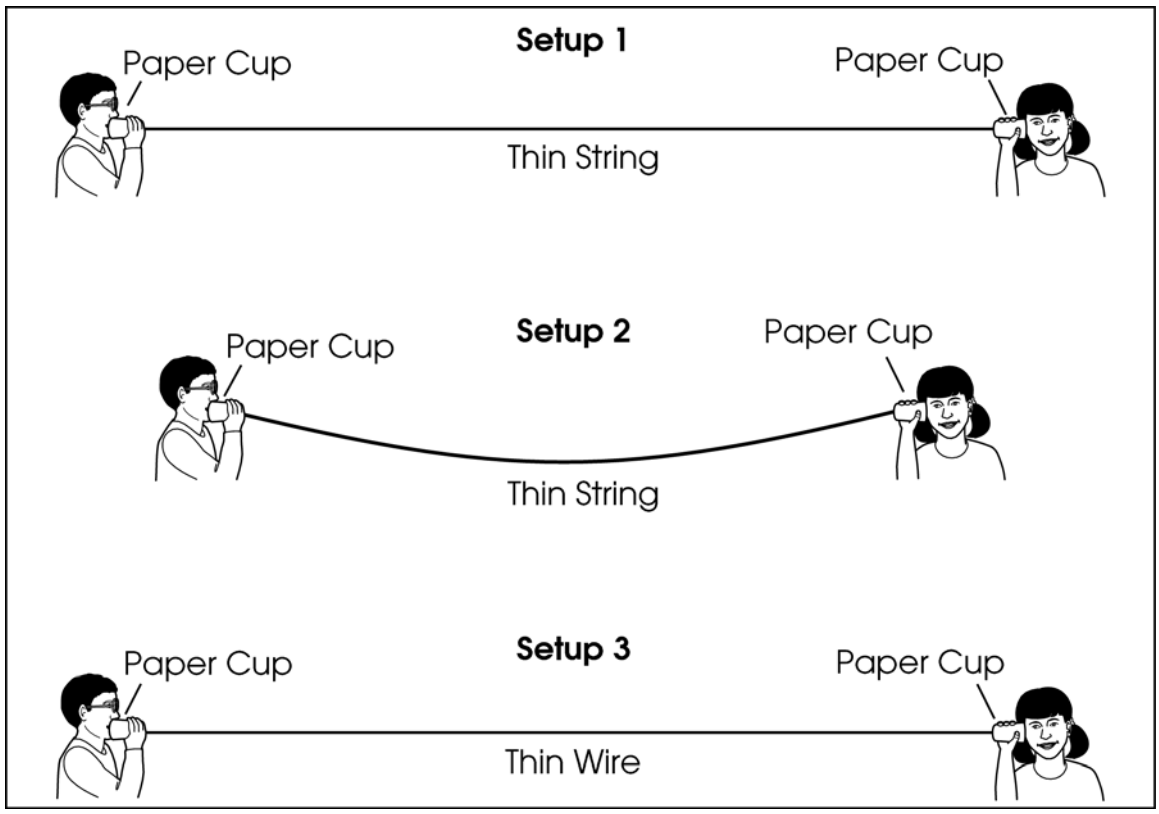
**Multiple Choice Question:**

**Use the following investigation to answer questions 27-31.**

**Model Telephone**

Two students want to find out what affects the sounds heard through model telephones. They investigate the materials used and the tightness of the material connecting the cups.

Their first three setups are shown. They use the same length of string or wire in each setup. The boy repeats the same sounds at the same volume for each setup.



They record results of the three setups in the table below.

**Model Telephone Investigation**

| Setup | Description of Sound Heard |
|---|---|
| 1 | Sound is Muffled |
| 2 | No Sound is Heard |
| 3 | Sound is Clear |

28. The sound in setup 3 was clearer than the sound in setup 1.

Which statement explains why?

A. String creates an echo.
B. String vibrates more than wire.
C. Wire is used for real telephones.
D. Wire transmits sound better than string.

**Commentary:**

This multiple choice question asks students to identify why the sound in setup 3 was clearer than the sound in setup 1 in a Model Telephone Investigation. Students must analyze the data from the investigation and understand that it indicates that the model telephone setup with wire transmitted sound better than the setup using string. Students must also understand that sound energy is transmitted better through dense materials than through materials that are less dense. Students should recognize that wire conducts sound energy better than string because wire is a more dense material. Answer choice D correct because the results of this investigation confirm that wire transmits sound better than string. Answer choice A is incorrect because there is no information suggesting that there was an echo in either setup. Echoes are created when sound bounces back from a smooth hard surface. Answer choice B is incorrect because string vibrates less than wire due to its lower density. Answer choice C is incorrect because the fact that wire is used for real telephones does not provide evidence for why setup 3 transmitted clearer sound than string. While wire is used in real telephones, telephone wires do not transmit sound waves; they transmit electrical signals that are translated into sound in the receiver of the telephone.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to apply their knowledge of how sound waves are generated and how sound energy is transmitted to this investigative scenario in order to evaluate the results of the investigation and provide scientific explanations for the observations.

**Performance Data:**

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 28**

The percent of public school students selecting answer choice D for question 28 on the May 2007 Ohio Grade 5 Achievement Test for Science was 74%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 29**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Inquiry |
| Benchmark: | C. Develop, design and safely conduct scientific investigations and communicate the results. |
| GLI: | 3.SI.C.6 |
| Level: | Demonstrating Investigation Processes of Science |
| Power Words: | compared |
| Keywords: | experimental design, investigation model, sound energy, sound waves |

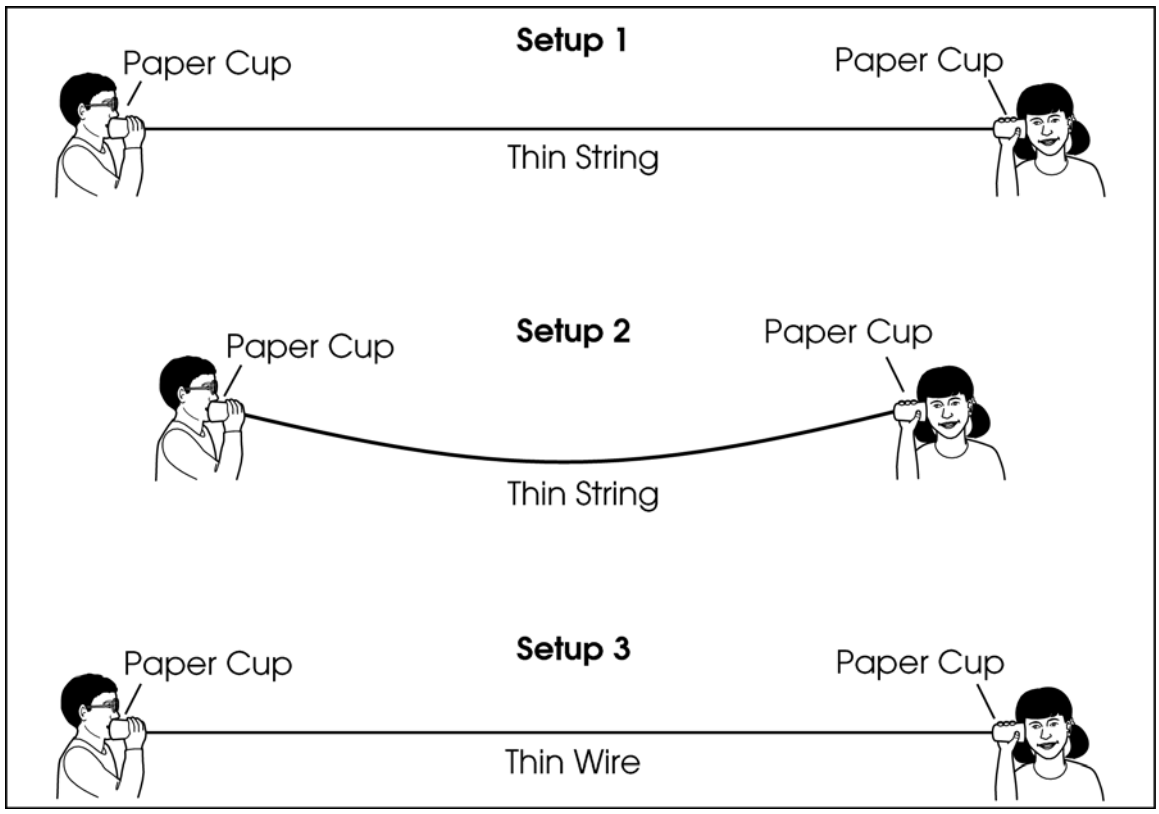
**Multiple Choice Question:**

**Use the following investigation to answer questions 27-31.**

**Model Telephone**

Two students want to find out what affects the sounds heard through model telephones. They investigate the materials used and the tightness of the material connecting the cups.

Their first three setups are shown. They use the same length of string or wire in each setup. The boy repeats the same sounds at the same volume for each setup.



They record results of the three setups in the table below.

**Model Telephone Investigation**

| Setup | Description of Sound Heard |
|---|---|
| 1 | Sound is Muffled |
| 2 | No Sound is Heard |
| 3 | Sound is Clear |

29. The two students want classmates to repeat the investigation so that they can compare results.

    What should the students communicate so that results may be compared?

    A. materials and steps used in the investigation
    B. conclusions about results from the investigation
    C. where they got the idea for making model telephones
    D. where to purchase the materials for model telephones

**Commentary:**

This multiple choice question asks students to identify what information should be shared in order for others to be able to repeat a Model Telephone Investigation. Students must know that in order to repeat the investigation and compare the results they must use the same materials and follow the same procedures that were used in the first investigation. Answer choice A is correct because in order for others to repeat the investigation, they must know the materials and steps used in the first investigation. Answer choice B is incorrect because it is not necessary for the students to communicate their conclusions in order for others to be able to repeat the investigation. Answer choice C is incorrect because initial ideas for an experiment have no bearing on whether the experiment can be repeated by others. Answer choice D is incorrect because it is insufficient to communicate where to purchase materials for the investigation; other students must know what steps were taken to be able to repeat the experiment.

The question is classified as Demonstrating Investigation Processes of Science because the task requires students to demonstrate an understanding of how to design and conduct a scientific investigation including how to communicate the procedures and methods of science to others.

**Performance Data:**

The percent of public school students selecting answer choice A for question 29 on the May 2007 Ohio Grade 5 Achievement Test for Science was 51%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 30**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Inquiry |
| Benchmark: | C. Develop, design and safely conduct scientific investigations and communicate the results. |
| GLI: | 5.SI.C.4<br>Identify one or two variables in a simple experiment. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | sound waves, sound energy, experimental design, investigation |

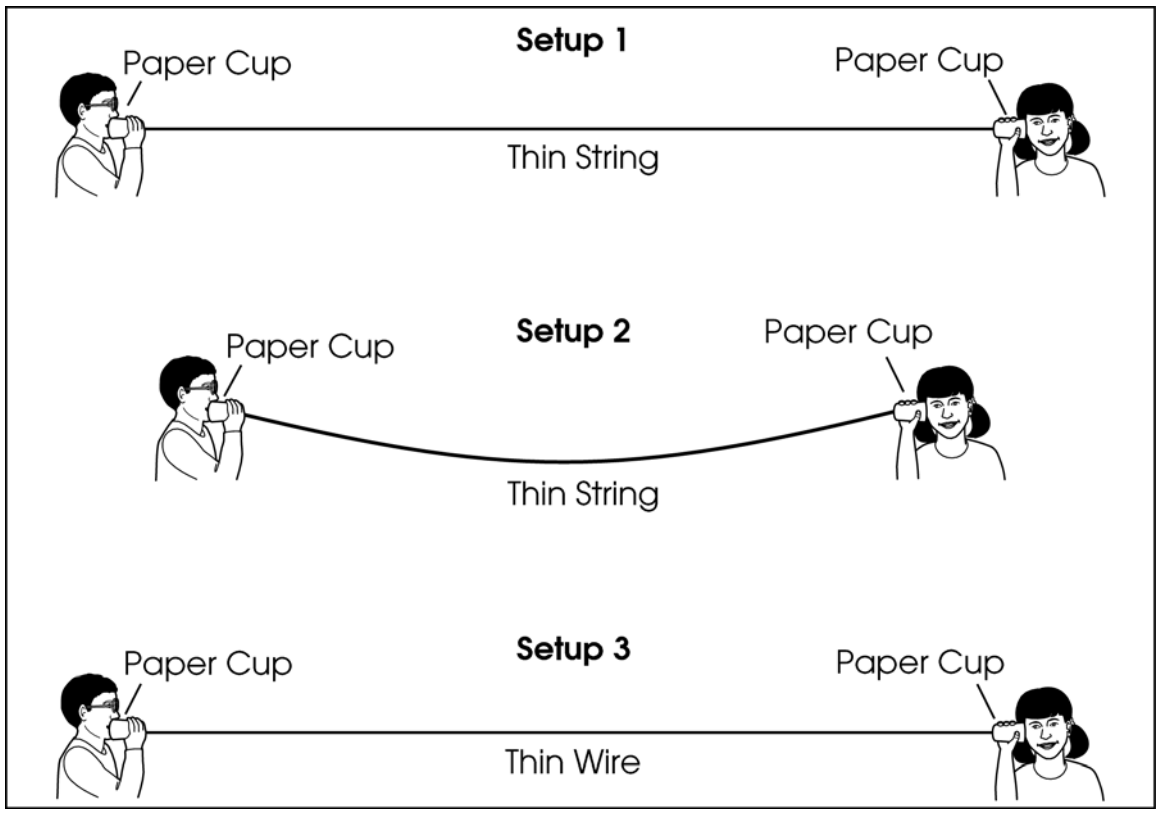
**Multiple Choice Question:**

**Use the following investigation to answer questions 27-31.**

**Model Telephone**

Two students want to find out what affects the sounds heard through model telephones. They investigate the materials used and the tightness of the material connecting the cups.

Their first three setups are shown. They use the same length of string or wire in each setup. The boy repeats the same sounds at the same volume for each setup.



They record results of the three setups in the table below.

**Model Telephone Investigation**

| Setup | Description of Sound Heard |
|---|---|
| 1 | Sound is Muffled |
| 2 | No Sound is Heard |
| 3 | Sound is Clear |

30. Which variable changed between setup 1 and setup 2?

A. the type of cups used
B. the number of cups used
C. the tightness of the string
D. the thickness of the string

**Commentary:**

This multiple choice question asks students to identify which variable changed between two experimental setups in a Model Telephone Investigation. Students should be able to identify variables in an investigation and understand the importance of keeping experimental conditions the same. Students must understand that the equipment used in the setups (i.e., cups, string, wire) as well as how these materials are used represent variables to consider. Students must evaluate the differences in experimental conditions between setup 1 and setup 2. Students should note that the same type of cup is used in all experimental setups and that same type of string is used in setup 1 and setup 2. Answer choice C is correct because the tightness of the string is the variable that changed between setup 1 and setup 2. In setup 1, the string is pulled tight, and in setup 2, the string is not pulled tight. Answer choice A is incorrect because the type of cup (paper) was the same in both setups. Answer choice B is incorrect because the number of cups (two) used in both setups was the same. Answer choice C is incorrect because the thickness of the string (thin) was the same in both setups.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to identify the variable that changes in two different trials of a scientific investigation.

**Performance Data:**

The percent of public school students selecting answer choice C for question 30 on the May 2007 Ohio Grade 5 Achievement Test for Science was 84%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 31**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Science and Technology |
| Benchmark: | B. Describe and illustrate the design process. |
| GLI: | 5.ST.B.2<br>Revise an existing design used to solve a problem based on peer review. |
| Level: | Applying Concepts / Making Relevant Connections with Science |
| Power Words: | |
| Keywords: | experimental design, sound waves, sound transmission, sound energy, investigation |

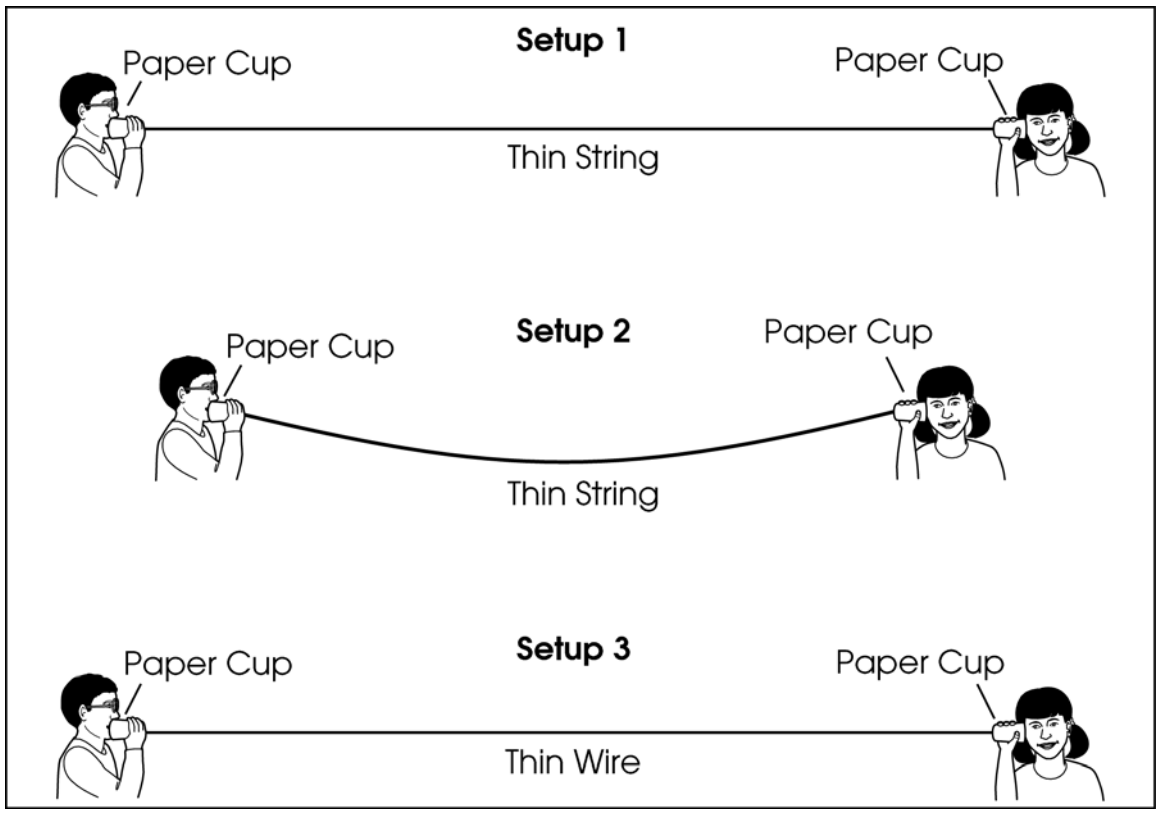
**Multiple Choice Question:**

**Use the following investigation to answer questions 27-31.**

**Model Telephone**

Two students want to find out what affects the sounds heard through model telephones. They investigate the materials used and the tightness of the material connecting the cups.

Their first three setups are shown. They use the same length of string or wire in each setup. The boy repeats the same sounds at the same volume for each setup.



They record results of the three setups in the table below.

**Model Telephone Investigation**

| Setup | Description of Sound Heard |
|---|---|
| 1 | Sound is Muffled |
| 2 | No Sound is Heard |
| 3 | Sound is Clear |

31. Two other students investigate model telephones made with paper and plastic cups. They find that sound is transmitted better using plastic cups.

    The class wants to make a model telephone that makes the best sound possible. They use the results of both investigations.

    Which setup should they use?

    A. plastic cups and tight string
    B. paper cups and tight string
    C. plastic cups and tight wire
    D. paper cups and tight wire

**Commentary:**

This multiple choice question asks students to use the results of two investigations to suggest an experimental setup to optimize a desired result. Students are provided data and results from both investigations and are told that the objective of the newly designed investigation is to produce a model telephone that makes the best sound. Students should recognize that the results of the second investigation suggest that using plastic cups in the model produced better sound than using paper cups. Students must incorporate this new information in light of the results from the previous experiment to describe parameters for a new design. Students should also observe that the previous investigation showed that a tight wire transmitted sound better than a tight or loose string. Students must recognize that incorporating both of these results should produce an experimental setup that will yield the best results. Answer choice C is correct because a model telephone setup using plastic cups and a tight wire should provide the best sound possible. According to the results of both experiments, the tight wire and the plastic cups allow sound waves (vibrations) to travel the best. Answer choice A is incorrect because even though this setup uses plastic cups, it also uses tight string which did not transmit sound the best in the first experiment. This design would not produce the best sound possible. Answer choice B is incorrect because this design uses neither the plastic cups nor the tight wire. This design would not produce the best sound possible. Answer choice D is incorrect because although this design incorporates a tight wire, it also uses paper cups rather than plastic cups.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 31

In the second investigation, students found that plastic cups were better at transmitting sound than paper cups. This design would not produce the best sound possible.

This question is classified as Applying Concepts / Making Relevant Connections with Science because the task requires students to incorporate results from two investigations to determine the criteria for the design of a model telephone that will produce the best sound possible considering two variables.

**Performance Data:**

The percent of public school students selecting answer choice C for question 31 on the May 2007 Ohio Grade 5 Achievement Test for Science was 70%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 32

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Inquiry |
| Benchmark: | C. Develop, design and safely conduct scientific investigations and communicate the results. |
| GLI: | 5.SI.C.5<br>Identify potential hazards and/or precautions involved in an investigation. |
| Level: | Demonstrating Investigation Processes of Science |
| Power Words: | identify, describe |
| Keywords: | states of water, experiment, investigation, thermal energy |

**Short Answer Question:**

32. Students study how water changes from liquid to gas. These are the steps in the class investigation.

**Materials**: electric heating coil, beaker and thermometer

**Procedure**:

1. Pour one liter of water into the beaker.
2. Place the thermometer in the water.
3. Record the temperature of the water.
4. Place the beaker on the heating coil.
5. Turn on the heating coil.
6. Record the temperature of the water every minute for 10 minutes.

In your **Answer Document**, identify one possible safety hazard in this investigation.

Also describe one way to make sure this is a safe investigation. (2 points)

**Commentary:**

This short answer question asks students to identify one possible safety hazard in a science investigation and one way to make the investigation safer. Students must review the materials and procedures for the investigation involving changing water from a liquid to a gas. Students should be able to identify potential safety concerns in an investigation and suggest safety procedures that are appropriate for a given scenario. Students should recognize that this investigation involves heat from an electric source, so burns and electrical shock are potential safety hazards. Students might also realize that if the beaker breaks, cuts from broken glass could be another hazard. Students could suggest that the investigation could be conducted more safely by using pot holders to prevent burns and by making sure the apparatus for the experiment is set up correctly so that nothing gets broken or spilled. The response that earns full credit identifies one safety hazard and identifies one way to ensure a safe investigation. It is not necessary that the safety hazard and the safety improvement be related to each other in order to receive full credit.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 32

This question is classified as Demonstrating Investigation Processes of Science because the task requires students to understand experimental design and recognize safety issues and concerns in order to provide a safety measure that will ensure a safe investigation.

**Performance Data:**

The percent of public school students earning each score point for question 32 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | |
|---|---|---|
| 0 | 1 | 2 |
| 29% | 43% | 28% |

**Sample Response for Item 32 (Short Answer):**

**Exemplar Response:**
Heating coil can burn skin. Keep a safe distance from the heating coil.

**Other Correct Response(s):**

- Experiment could be set up incorrectly. Have the teacher check the set-up first.
- Use potholders or kitchen gloves to avoid being burned.
- Keep glass beakers away from the edge to avoid being knocked over and broken. This will prevent cuts.
- To avoid being shocked stay away from wet surfaces and dry hands before plugging things in to sockets.
- Keep thermometers from touching the bottom of the beaker during heating so that the thermometer does not break.
- Heating coil can burn skin. Let the teacher conduct the investigation.
- When reading the thermometer while the beaker is on the heating coil, use a thermometer with large numbers so that they can be read from a distance. Do not touch the thermometer while the beaker is on the heating coil.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 2 point | The intent of this item is for students to identify a potential safety hazard and describe one way to make sure that the investigation is safe.<br><br>The response provides the identification of a potential safety hazard AND a description of one way to make sure the experiment is safe. |
| 1 point | The response provides the identification of a potential safety hazard<br>OR |

| | |
|---|---|
| | a description of one way to make sure the investigation is safe without describing the associated safety hazard. |
| | 1 point sample answer:<br>The students may get burned. |
| 0 point | The response fails to demonstrate any understanding of the safety hazards involved in the investigation. 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 very 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.” |
| | 0 point sample answer:<br>The students are conducting an investigation. |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 34

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system. |
| GLI: | 5.ES.A.4<br>Explain that stars are like the sun, some being smaller and some larger, but so far away that they look like points of light. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | explains |
| Keywords: | stars, night sky, points of light, star distance |

**Multiple Choice Question:**

34. From Earth, we see the sun in the day sky and other stars in the night sky. Nighttime stars look like tiny points of light.

    Which statement explains why nighttime stars appear so much smaller than the sun?

    A. The stars are much smaller.
    B. The sky is much darker at night.
    C. The stars are much farther away.
    D. The moon blocks out most starlight.

**Commentary:**

This multiple choice question asks students to explain why stars seem smaller in the night sky compared to the sun. Students must recall that the sun is the closest star to Earth while other stars are much farther away from Earth. Students should also remember that stars have different sizes and that the sun is an average-sized star. Answer choice C is correct because the sun appears larger because it is much closer to Earth than the next closest star. All other stars are at a greater distance from Earth, so they appear significantly smaller. Answer choice A is incorrect because while some stars are smaller and others are larger, it is the star's distance from Earth that makes them appear smaller, not their size. Answer choice B is incorrect because while the nighttime sky (darkness) makes it possible to observe stars that are far from Earth, it is not the reason why they appear so much smaller than the sun. Answer choice D is incorrect because light from the moon may prevent us from seeing some stars at night, but it is distance that makes them appear very small.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to recall that stars appear as small points of light because of their vast distance from Earth.

**Performance Data:**

The percent of public school students selecting answer choice C for question 34 on the May 2007 Ohio Grade 5 Achievement Test for Science was 76%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 35**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Physical Sciences |
| Benchmark: | C. Describe the forces that directly affect objects and their motion. |
| GLI: | 3.PS.C.3<br>Identify contact/noncontact forces that affect motion of an object (e.g., gravity, magnetism and collision). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | forces, motion, gravity, weight, pull |

**Multiple Choice Question:**

35. The principal's chair has wheels. It sits on her office floor next to her desk. She pulls the chair away from her desk.

What makes the chair move?

A. the force of gravity on the chair
B. the force of her pull on the chair
C. friction between her hand and the chair
D. friction between the wheels and the floor

**Commentary:**

This multiple choice question asks students to determine what force makes a chair with wheels move when it is pulled away from a desk. Students must recall that when an object (the chair) is at rest balanced forces are acting on it; the force of gravity pulls the chair toward the center of Earth and the floor pushes back on the chair. These forces keep the chair stationary. Students should recognize that when the principal pulls the chair, another force is applied to the chair and the forces are no longer balanced. When an object is acted on by unbalanced forces, it will experience a change in its motion (speed and/or direction). Answer choice B is correct because the force of the principal's pull on the chair makes it move. Answer choice A is incorrect

because the force of gravity on the chair does not make the chair move since the gravity force is balanced by the force of the floor pushing up on the chair. Answer choice C is incorrect because the force of friction between the chair and principal's hand does not cause the chair to move. The force of friction between the chair and the principal's hand is what allows her to pull the chair (i.e., her hand does not slip off the chair) but friction does not make the chair move. Answer choice D is incorrect because the force of friction between the wheels of the chair and floor do not cause the chair to move. Friction is a force that opposes motion; it does not cause motion. The force of friction depends on both the object's weight and the properties of the materials with which the object is made.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to identify that a force must be applied in order for an object to move. Students must also recognize which force causes the motion of the chair in the given scenario.

**Performance Data:**

The percent of public school students selecting answer choice B for question 35 on the May 2007 Ohio Grade 5 Achievement Test for Science was 73%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 36**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | A. Differentiate between the life cycles of different plants and animals. |
| GLI: | 3.LS.A.1<br>Compare the life cycles of different animals including birth to adulthood, reproduction and death (e.g., egg-tadpole-frog, egg-caterpillar-chrysalis-butterfly). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | life cycles, birth, animal characteristics |

**Multiple Choice Question:**

**Use the following table to answer questions 36-38.**

**Some Animals Found in Ohio**

| Animal | Life Cycle | Adult Age | Life Span | Food | Habitat |
|---|---|---|---|---|---|
| Potato Beetle | Egg, Larva, Pupa, Adult | 1Month | 1-2 Years | Leaves of: Potatoes, Tomatoes, Other Crops | Crop Fields |
| Red-tailed Hawk | Egg, Young, Adult | 3 Years | 10-12 Years | Mice, Insects, Small Snakes | Grasslands, Crop Fields |
| Black Bear | Young, Adult | 4 Years | 25-30 Years | Fish, Insects, Fruit, Plants, Small Animals | Woodlands, Low Mountains |
| North American Beaver | Young, Adult | 3 Years | 15-19 Years | Tree Bark, Shrubs, Water Plants | Rivers, Ponds |

A student created this table for a report on animals that can be found in Ohio.

36. Which animals give birth to live young?

A. hawk and black bear
B. beaver and black bear
C. hawk and potato beetle
D. beaver and potato beetle

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 36

**Commentary:**

This multiple choice question asks students to select which animals (in a student data table of Ohio animals) give birth to live young. Students must read and interpret the information provide in the *Some Animals Found in Ohio* chart. Students must be able to differentiate between and compare the life cycles of different plants and animals. Students must recall that nearly all mammals give birth to live young. Answer choice B is correct because both the black bear and the beaver are mammals and give birth to live young. Answer choice A is incorrect because a hawk is born from an egg laid by the mother in a nest. Answer choice C is incorrect because the potato beetle and sparrow hawk both are born from eggs laid by the mother. Answer choice D is incorrect because the beaver is born live and the potato beetle comes from an egg laid by the mother.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students use information provided in a chart to compare the life cycles of various Ohio animals and identify a common characteristic of two animals.

**Performance Data:**

The percent of public school students selecting answer choice B for question 36 on the May 2007 Ohio Grade 5 Achievement Test for Science was 73%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 37**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Scientific Ways of Knowing |
| Benchmark: | A. Distinguish between fact and opinion and explain how ideas and conclusions change as new knowledge is gained. |
| GLI: | 5.SK.A.1<br>Summarize how conclusions and ideas change as new knowledge is gained. |
| Level: | Demonstrating Investigation Processes of Science |
| Power Words: | |
| Keywords: | life cycles, conclusion, opinion, fact, inference |

**Multiple Choice Question:**

**Use the following table to answer questions 36-38.**

**Some Animals Found in Ohio**

| Animal | Life Cycle | Adult Age | Life Span | Food | Habitat |
|---|---|---|---|---|---|
| Potato Beetle | Egg, Larva, Pupa, Adult | 1 Month | 1-2 Years | Leaves of: Potatoes, Tomatoes, Other Crops | Crop Fields |
| Red-tailed Hawk | Egg, Young, Adult | 3 Years | 10-12 Years | Mice, Insects, Small Snakes | Grasslands, Crop Fields |
| Black Bear | Young, Adult | 4 Years | 25-30 Years | Fish, Insects, Fruit, Plants, Small Animals | Woodlands, Low Mountains |
| North American Beaver | Young, Adult | 3 Years | 15-19 Years | Tree Bark, Shrubs, Water Plants | Rivers, Ponds |

A student created this table for a report on animals that can be found in Ohio.

37. Student A studies the potato beetle. He concludes that all animals that lay eggs only live in crop fields.

    Student B notes that the red-tailed hawk lays eggs. It lives in both grasslands and crop fields.

    What should student A do with his own conclusion?

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 37

A. Keep the conclusion. The new data confirm it.
B. Keep the conclusion. The new data are not related to it.
C. Revise the conclusion. Collect more data about animals that live in crop fields.
D. Revise the conclusion. Collect more data about habitats of animals that lay eggs.

**Commentary:**

This multiple choice question asks students to evaluate a conclusion based on data collected by two students. Students must understand that scientific conclusions must be supported by facts and as new evidence is collected and presented, conclusions may need to be revised. When scientific findings seem to conflict, more data should be collected to support a scientifically valid conclusion. Answer choice D is correct because the information collected by student B should cause student A to revise his conclusion and continue collecting more data about the habitats of animals that lay eggs. Answer choice A is incorrect because student B's data does not support student A's conclusions but indicates, instead, that there are animals who lay eggs and do not live in crop fields. Answer choice B is incorrect because student B's data is related to student A's conclusion since both students collected data about animals that lay eggs but student B's data do not support student A's conclusion. Answer choice C is incorrect because student A concluded that all animals that lay eggs only live in crop fields so continuing to collect information about animals that live in crop fields will not answer the question about whether animals that lay eggs live in other habitats.

This question is classified as Demonstrating Investigation Processes of Science because the task requires students to use logical reasoning to interpret how one student's conclusion contradicts another student's conclusion, and then suggest the next step that should be taken to evaluate the scientific conclusions presented.

**Performance Data:**

The percent of public school students selecting answer choice D for question 37 on the May 2007 Ohio Grade 5 Achievement Test for Science was 55%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 38**

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | C. Compare changes in an organism's ecosystem/habitat that affect its survival. |
| GLI: | 5.LS.C.6<br>Analyze how all organisms, including humans, cause changes in their ecosystems and how these changes can be beneficial, neutral or detrimental (e.g., beaver ponds, earthworm burrows, grasshoppers eating plants, people planting and cutting trees and people introducing a new species). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | describe |
| Keywords: | ecosystem, survival, habitat, animal, food supply |

**Short Answer Question:**

**Use the following table to answer questions 36-38.**

**Some Animals Found in Ohio**

| Animal | Life Cycle | Adult Age | Life Span | Food | Habitat |
|---|---|---|---|---|---|
| Potato Beetle | Egg, Larva, Pupa, Adult | 1 Month | 1-2 Years | Leaves of: Potatoes, Tomatoes, Other Crops | Crop Fields |
| Red-tailed Hawk | Egg, Young, Adult | 3 Years | 10-12 Years | Mice, Insects, Small Snakes | Grasslands, Crop Fields |
| Black Bear | Young, Adult | 4 Years | 25-30 Years | Fish, Insects, Fruit, Plants, Small Animals | Woodlands, Low Mountains |
| North American Beaver | Young, Adult | 3 Years | 15-19 Years | Tree Bark, Shrubs, Water Plants | Rivers, Ponds |

A student created this table for a report on animals that can be found in Ohio.

38. In your **Answer Document**, describe two ways that a forest fire would affect the black bear. (2 points)

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 38

**Commentary:**

This short answer question asks students to describe how a forest fire would affect a black bear in Ohio. Students must examine the table *Some Animals Found in Ohio* to identify the animal's habitat and food sources. From information provided by this table, students can infer that a forest fire would affect the black bear's habitat (woodlands) and food supply (fruit, plants, and small animals). Students could explain that the destruction of the trees by fire will eliminate the fruit, small animals and insects that live on or around the trees and these organisms will no longer be available to the bear as food. Students could suggest that as a result of loss of habitat and food supply, the black bear would have to relocate to a new environment with a similar habitat and food supply. The response that earns full credit correctly interprets information from the data table to describe two ways that a forest fire will likely affect a black bear.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to extract information from a table to predict how a bear would be affected by a forest fire. Students must integrate information from the data table with their own knowledge of bears and their habitats and resource needs.

**Performance Data:**

The percent of public school students earning each score point for question 38 on the May 2007 Ohio Grade 5 Achievement Test for Science:

| Percent at Each Score Point | | |
|---|---|---|
| 0 | 1 | 2 |
| 15% | 28% | 57% |

**Sample Response for Item 38 (Short Answer):**

**Exemplar Response:**
The black bear would have less food to eat because the small animals would have run away. The bear would have to move to another part of the forest because his home is burned.

**Other Correct Response(s):**
Acceptable affects of the fire on the black bear include:
- The black bear would have less food to eat because the small animals would have run away.
- The bear would move to another part of the forest because its home/habitat/area where it lives is burned.
- The fire would burn plants that are a food source.

**Scoring Guidelines:**

| Points | Student Response |
|---|---|
| 2 point | The response provides correct descriptions of two ways a |

| | |
|---|---|
| | forest fire would affect the black bear's survival in its habitat. |
| 1 point | The response provides a correct description of one way a forest fire would affect the black bear's survival in its habitat. |
| | 1 point sample answer:<br>The bear could get caught in the fire and die. |
| 0 point | The response fails to demonstrate any understanding of how a forest fire could affect a black bear. 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 very 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." |
| | 0 point sample answer:<br>A fire burns the forest and affects the black bear. |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 39

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | D. Analyze weather and changes that occur over a period of time. |
| GLI: | 4.ES.D.7<br>Describe the weather which accompanies cumulus, cumulonimbus, cirrus and stratus clouds. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | weather, forecast, observation, clouds |

**Multiple Choice Question:**

39. The weather forecast says a heavy snowstorm is coming later today.

    Which weather observation is likely just before the snow?

    A. clear sky
    B. thick grey clouds
    C. small white clouds
    D. warm temperature

**Commentary:**

This multiple choice question asks students to recognize what weather observation is most likely just before a heavy snowstorm occurs. Students must recall that certain types of clouds accompany particular patterns of weather. Answer choice B is correct because cumulonimbus clouds (thick grey clouds) often produce snow during cold weather. Answer choice A is incorrect because the sky tends to be clear following a snow storm, not just before the storm. Answer choice C is incorrect because cumulus clouds (small white clouds) are associated with fair weather. Answer choice D is incorrect because warm temperatures are not associated with snowstorms which typically occur during cold weather.

This question is classified as Recalling/Identifying Accurate Science because the task requires students to recognize weather changes related to cloud types.

**Performance Data:**

The percent of public school students selecting answer choice B for question 39 on the May 2007 Ohio Grade 5 Achievement Test for Science was 69%.

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 40

**Standard and Benchmark Assessed:**

| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system. |
| GLI: | 5.ES.A.1<br>Describe how night and day are caused by Earth's rotation. |
| Level: | Recalling/Identifying Accurate Science |
| Power Words: | |
| Keywords: | day, night, Earth's rotation, cycles, patterns |

**Multiple Choice Question:**

40. What causes day and night on Earth?

A. tilting of Earth's axis
B. rotation of Earth on its axis
C. movement of Earth around the sun
D. movement of the sun around Earth

**Commentary:**

This multiple choice question asks students to identify the cause of day and night on Earth. Students must know the characteristics, cycles and patterns about Earth and its place in the solar system. Students should recall that the cause of day and night is the rotation (spinning) of Earth on its axis. Answer choice B is correct because the rotation of Earth on its axis causes day and night. Answer choice A is incorrect because the tilt of Earth's axis results in the seasons due to the changing angle of the sun's light on Earth's surface. Answer choice C is incorrect because the movement of Earth around the sun determines the length of a year but does not cause day and night on Earth. Answer choice D is incorrect because the sun does not move around Earth.

This question is classified as because the task requires students to correctly recall information about Earth and its place in the solar system including that the rotation of Earth on its axis is what causes day and night.

**Performance Data:**

The percent of public school students selecting answer choice B for question 40 on the May 2007 Ohio Grade 5 Achievement Test for Science was 59%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 41**

**Standard and Benchmark Assessed:**

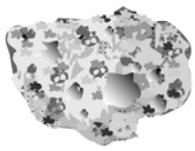
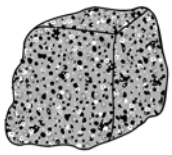
| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | C. Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved. |
| GLI: | 3.ES.C.4<br>Observe and describe the composition of soil (e.g., small pieces of rock and decomposed pieces of plants and animals, and products of plants and animals). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | sedimentary, igneous, rocks, minerals, layers, Properties of Rocks |

**Multiple Choice Question:**

**Use the information in the table to answer questions 41-44.**

A teacher gives students five rock samples to describe and sketch. The students record their observations in the table below.

**Rock Samples**

| Sample | Observations | Sketch |
|---|---|---|
| Limestone | • tiny grains arranged in layers<br>• feels gritty<br>• reddish tan or gray<br>• has a fish fossil |  |
| Conglomerate | • small rocks and pebbles of different colors stuck together<br>• feels lumpy |  |
| Obsidian | • looks like black glass<br>• cannot see parts of other things<br>• feels smooth |  |
| Pumice | • light gray<br>• has tiny holes like a sponge<br>• very lightweight<br>• feels very rough |  |
| Granite | • tiny specks that are black, white and gray<br>• specks are about the same size<br>• feels rough |  |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 41

41. Sedimentary rocks have visible layers of small pieces of other rocks.

Based on the information in the rock sample table, which is a sedimentary rock?

A. pumice
B. granite
C. obsidian
D. limestone

**Commentary:**

This multiple choice question asks students to identify which is a sedimentary rock based on information in a *Rock Sample* data table. Students must recall that different types of rock have distinct characteristics that can be observed. Students should recognize that sedimentary rocks can have visible layers and can contain fossils. Students should notice that the observations recorded in the student data table indicate that the limestone sample is arranged in layers and contains a fish fossil. Answer choice D correct because limestone is the only choice that has tiny grains arranged in layers which would be expected of a sedimentary rock sample. Answer choice A is incorrect because pumice is an igneous rock and it does not have the characteristics expected of a sedimentary rock as it is light weight and has holes in it (which were formed from air bubbles during its formation). Answer choice B is incorrect because granite is an igneous rock. This is confirmed by the observation that there are minerals (tiny specks) found in the sample that does not appear to be separate pieces of material stuck into the rock. Answer choice C is incorrect because obsidian is an igneous rock that has a smooth glassy surface with no pieces of other rocks embedded in it or layers.

This question is classified as Communicating Understanding / Analyzing Science Information because the task students to recall the characteristics of sedimentary, igneous and metamorphic rocks and then evaluate observations of rock samples and determine what type of rock the evidence supports.

**Performance Data:**

The percent of public school students selecting answer choice D for question 41 on the May 2007 Ohio Grade 5 Achievement Test for Science was 50%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 42**

**Standard and Benchmark Assessed:**

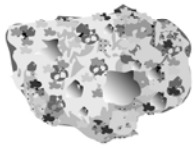
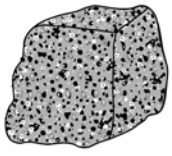
| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | C. Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved. |
| GLI: | 3.ES.C.1<br>Compare distinct properties of rocks (e.g., color, layering and texture). |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | sedimentary, igneous, rocks, minerals, layers, Properties of Rocks |

**Multiple Choice Question:**

**Use the information in the table to answer questions 41-44.**

A teacher gives students five rock samples to describe and sketch. The students record their observations in the table below.

**Rock Samples**

| Sample | Observations | Sketch |
|---|---|---|
| Limestone | • tiny grains arranged in layers<br>• feels gritty<br>• reddish tan or gray<br>• has a fish fossil |  |
| Conglomerate | • small rocks and pebbles of different colors stuck together<br>• feels lumpy |  |
| Obsidian | • looks like black glass<br>• cannot see parts of other things<br>• feels smooth |  |
| Pumice | • light gray<br>• has tiny holes like a sponge<br>• very lightweight<br>• feels very rough |  |
| Granite | • tiny specks that are black, white and gray<br>• specks are about the same size<br>• feels rough |  |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 42

42. How is conglomerate different from the other rock samples?

A. It contains pebbles.
B. It has visible layers.
C. It has a rough texture.
D. It is all the same color.

**Commentary:**

This multiple choice question asks students to identify how the conglomerate rock sample is different from the other rock samples in a *Rock Sample* table. Students must read and interpret the *Rock Sample* table observations and note similarities and differences in the rock samples. Students should observe that the conglomerate rock sample has other rocks and pebbles in it. Answer choice A is correct because the conglomerate sample is described and depicted as containing rocks and pebbles of different colors. Answer choice B is incorrect because the table describes only the limestone sample as having layers, not the conglomerate. Answer choice C is incorrect because only the pumice and granite samples are described as having a rough texture, whereas the conglomerate sample is described as being lumpy. Answer choice D is incorrect because the only rock sample described as having a uniform color is the obsidian sample. The conglomerate sample has different colored pieces of rocks and pebbles in it, and other rock samples (like granite) have different colored parts to them.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to interpret a data table of observations of different types of rocks and identify which statement correctly describes how a conglomerate sample is different from the other rock samples.

**Performance Data:**

The percent of public school students selecting answer choice A for question 42 on the May 2007 Ohio Grade 5 Achievement Test for Science was 74%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 43**

**Standard and Benchmark Assessed:**

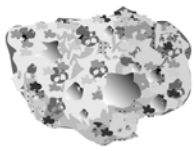
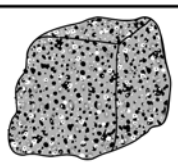
| | |
|---|---|
| Standard: | Earth and Space Sciences |
| Benchmark: | B. Summarize the processes that shape Earth's surface and describe evidence of those processes. |
| GLI: | 3.ES.B.3<br>Describe that smaller rocks come from the breakdown of larger rocks through the actions of plants and weather. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | |
| Keywords: | weathering, erosion, geologic processes |

**Multiple Choice Question:**

**Use the information in the table to answer questions 41-44.**

A teacher gives students five rock samples to describe and sketch. The students record their observations in the table below.

**Rock Samples**

| Sample | Observations | Sketch |
|---|---|---|
| Limestone | • tiny grains arranged in layers<br>• feels gritty<br>• reddish tan or gray<br>• has a fish fossil |  |
| Conglomerate | • small rocks and pebbles of different colors stuck together<br>• feels lumpy |  |
| Obsidian | • looks like black glass<br>• cannot see parts of other things<br>• feels smooth |  |
| Pumice | • light gray<br>• has tiny holes like a sponge<br>• very lightweight<br>• feels very rough |  |
| Granite | • tiny specks that are black, white and gray<br>• specks are about the same size<br>• feels rough |  |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 43

43. Mount Rushmore is in South Dakota. This statue was carved more than 60 years ago. The faces on this granite statue are slowly wearing away.

Which natural process causes this wearing away?

A. earthquakes
B. water from floods
C. blowing wind and rain
D. lava flowing from volcanoes

**Commentary:**

This multiple choice question asks students to select the natural process that is wearing away the faces on Mount Rushmore. Students are told that Mount Rushmore is carved in granite and that it was carved more than 60 years ago. Students must recall that erosion and weathering are responsible for changing the surface of rock over time. Wind and rain are the agents that smooth and wear away the surfaces of rock producing a more smooth surface. Answer choice C is correct because blowing wind and rain are the natural processes that are wearing away the carving. Answer choice A is incorrect because earthquakes cause immediate damage and could cause the monument fall but would not wear it away over time. Answer choice B is incorrect because flood water will not wear away the carving since it is on the side of a mountain and not in a valley where floods are likely to occur. Answer choice D is incorrect because lava flowing from a volcano is a rapid process and will not cause the weathering or erosion of stone over time.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to understand the slow and rapid processes that shape the Earth's surface. Students must choose the process that explains the scenario given, taking into account the change that occurs, the speed of the change, and other environmental and geographic factors.

**Performance Data:**

The percent of public school students selecting answer choice C for question 43 on the May 2007 Ohio Grade 5 Achievement Test for Science was 71%.

**Ohio Grade 5 Achievement Test for Science – May 2007**
**Annotated Item 44**

**Standard and Benchmark Assessed:**

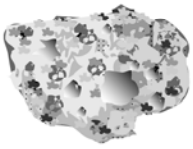
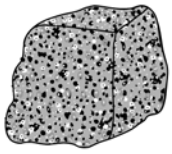
| | |
|---|---|
| Standard: | Life Sciences |
| Benchmark: | C. Compare changes in an organism's ecosystem/habitat that affect its survival. |
| GLI: | 3.LS.C.5<br>Observe and explore how fossils provide evidence about animals that lived long ago and the nature of the environment at that time. |
| Level: | Communicating Understanding / Analyzing Science Information |
| Power Words: | describes |
| Keywords: | ecosystem, habitat, survival, desert, fish |

**Multiple Choice Question:**

**Use the information in the table to answer questions 41-44.**

A teacher gives students five rock samples to describe and sketch. The students record their observations in the table below.

**Rock Samples**

| Sample | Observations | Sketch |
|---|---|---|
| Limestone | • tiny grains arranged in layers<br>• feels gritty<br>• reddish tan or gray<br>• has a fish fossil |  |
| Conglomerate | • small rocks and pebbles of different colors stuck together<br>• feels lumpy |  |
| Obsidian | • looks like black glass<br>• cannot see parts of other things<br>• feels smooth |  |
| Pumice | • light gray<br>• has tiny holes like a sponge<br>• very lightweight<br>• feels very rough |  |
| Granite | • tiny specks that are black, white and gray<br>• specks are about the same size<br>• feels rough |  |

# Ohio Grade 5 Achievement Test for Science – May 2007
# Annotated Item 44

44. The limestone sample was found in an area of Wyoming that is now a desert.

Which statement describes what scientists can learn from the rock?

A. There once was a lake in that area.
B. There once was a glacier in that area.
C. There once were a lot of trees and plants in that area.
D. There once were fish that lived on dry land in that area.

**Commentary:**

This multiple choice question asks students to examine student observations of a limestone sample found in a desert to identify what scientists can learn from the rock. Students will observe from the *Rock Samples* data table that the limestone sample has a fish fossil. Students can infer the type of environment that was in the area when the sediment that formed the rock was being deposited. Answer choice A is correct because in order to find a fish fossil in the rock, the area once must have been a lake. Students also may know that limestone forms chemically in solution and that water is required for it to form. Answer choice B is incorrect because finding the fish fossil does not provide evidence that there was once a glacier in the area since fish do not live in frozen water. Answer choice C is incorrect because the presence of a fish fossil in the limestone does not provide evidence about plant life that may have grown in the area. Answer choice D is incorrect because the fish fossil does not provide evidence that this fish species lived out of water.

This question is classified as Communicating Understanding / Analyzing Science Information because the task requires students to combine their understanding of the fossil record and the characteristics of rock to reason what information about the rock sample can be to provide evidence of what the environment was like when and where the rock formed.

**Performance Data:**

The percent of public school students selecting answer choice A for question 44 on the May 2007 Ohio Grade 5 Achievement Test for Science was 57%.