pennsylvania
DEPARTMENT OF EDUCATION

The Pennsylvania System of School Assessment

Science
Item and Scoring Sampler

2017–2018
Grade 4

Pennsylvania Department of Education Bureau of Curriculum, Assessment and Instruction—September 2017

TABLE OF CONTENTS

INFORMATION ABOUT SCIENCE

INTRODUCTION

The Pennsylvania Department of Education provides districts and schools with tools to assist in delivering focused instructional programs aligned with the Pennsylvania Academic Standards (PAS). In addition to the PAS, these tools include Assessment Anchor documents, assessment handbooks, and content-based item and scoring samplers. Each Item and Scoring Sampler is a useful tool for Pennsylvania educators in preparing local instructional programs and can also be useful in preparing students for the statewide assessment.

This Item and Scoring Sampler is available in Braille format. For more information regarding Braille, call (717) 901-2238.

WHAT IS INCLUDED

This sampler contains test questions, or test "items," that have been written to align to the Assessment Anchors that are based on the PAS. The sample test questions model the types of items that will appear on an operational PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors prior to being piloted in an embedded field test within a PSSA assessment and then used operationally on a PSSA assessment. Answer keys, scoring guidelines, and any related stimulus material are also included. Additionally, sample student responses are provided with each open-ended item to demonstrate the range of responses that students provided in response to these items.

PURPOSES AND USES

The items in this sampler may be used as models for creating assessment items at the classroom level, and they may also be copied and used as part of a local instructional program.[1] Classroom teachers may find it beneficial to have students respond to the open-ended items in this sampler. Educators can then use the item's scoring guideline and sample responses as a basic guide to score the responses, either independently or together with colleagues within a school or district. The sampler also includes the *General Description of Scoring Guidelines for Science Open-Ended Items* used to develop the item-specific guidelines. The general description of scoring guidelines can be used if any additional item-specific scoring guidelines are created for use within local instructional programs.[1]

ITEM FORMAT AND SCORING GUIDELINES

The multiple-choice (MC) questions have four answer choices. Each correct response to an MC question is worth one point.

Each open-ended (OE) item in science is scored using an item-specific scoring guideline based on a 0–2 point scale.

TESTING TIME AND MODE OF TESTING DELIVERY FOR THE PSSA

The PSSA is delivered in traditional paper-and-pencil format as well as in an online format. The estimated time to respond to a test question is the same for both methods of test delivery. During an official testing administration, students are given additional time as necessary to complete the test questions. The following table shows the estimated response time per item for each item type.

Science Item Type	MC	OE
Estimated Response Time (minutes)	1	5

[1] The permission to copy and/or use these materials does not extend to commercial purposes.

ITEM AND SCORING SAMPLER FORMAT

This sampler includes the test directions and scoring guidelines that appear in the PSSA science assessments. Each sample multiple-choice question is followed by a table that includes the alignment, the answer key, the depth of knowledge (DOK) level, the percentage[2] of students who chose each answer option, and a brief answer-option analysis or rationale. Each open-ended item is followed by a table that includes the item alignment, DOK, and mean student score. Additionally, each of the included item-specific scoring guidelines is combined with sample student responses representing each score point to form a practical, item-specific scoring guide. The *General Description of Scoring Guidelines for Science Open-Ended Items* used to develop the item-specific scoring guidelines should be used if any additional item-specific scoring guidelines are created for use within local instructional programs.

Example Multiple-Choice Question Information Table

Item Information	
Alignment	Assigned AAEC
Answer Key	Correct Answer
Depth of Knowledge	Assigned DOK
p-value A	Percentage of students who selected option A
p-value B	Percentage of students who selected option B
p-value C	Percentage of students who selected option C
p-value D	Percentage of students who selected option D
Option Annotations	Brief answer-option analysis or rationale

Example Open-Ended Item Information Table

Alignment	Assigned AAEC	**Depth of Knowledge**	Assigned DOK	**Mean Score**	

[2] All *p*-value percentages listed in the item information tables have been rounded.

SCIENCE TEST DIRECTIONS

On the following pages are the Science questions. There are two types of questions.

Multiple-Choice Questions:

Some questions will ask you to select an answer from among four choices. These questions will be found in your test booklet.

For the multiple-choice questions:

- Read each question, and choose the best answer.
- Record your choice in the answer booklet.
- Only one of the answers provided is the correct response.

Open-Ended Questions:

Other questions will require you to write your response. These questions will be found in your answer booklet.

For the open-ended questions:

- Be sure to read the directions carefully.
- If the question asks you to do two tasks, be sure to complete both tasks.
- If the question asks you to compare, be sure to compare. Also, if the question asks you to explain, describe, or identify, be sure to explain, describe, or identify.

GENERAL DESCRIPTION OF SCORING GUIDELINES FOR SCIENCE OPEN-ENDED ITEMS

2 Points

- The response demonstrates a *thorough* understanding of the scientific content, concepts, and procedures required by the task(s).
- The response provides a clear, complete, and correct response as required by the task(s). The response may contain a minor blemish or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

1 Point

- The response demonstrates a *partial* understanding of the scientific content, concepts, and procedures required by the task(s).
- The response is somewhat correct with *partial* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

0 Points

- The response provides *insufficient* evidence to demonstrate any understanding of the scientific content, concepts, and procedures as required by the task(s) for that grade level.
- The response may show only information copied or rephrased from the question or *insufficient* correct information to receive a score of 1.

THIS PAGE IS INTENTIONALLY BLANK.

MULTIPLE-CHOICE QUESTIONS

1. Which process has increased the availability of fresh food to many people all over the United States?

A. boiling and storing food in glass jars

B. packing meat in salt to remove water

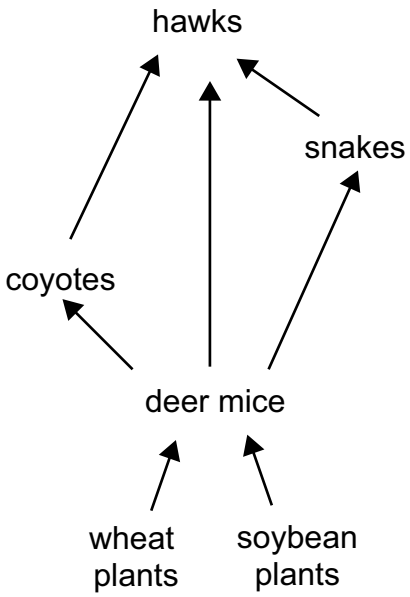
C. transporting food in refrigerated trucks

D. using stoves powered by natural gas to cook food

Item Information	
Alignment	S4.A.1.1.2
Answer Key	C
Depth of Knowledge	2
p-value A	14%
p-value B	9%
p-value C	53% (correct answer)
p-value D	24%
Option Annotations	A. Boiling and storing food in glass jars preserves it for later use. B. Packing meat in salt preserves the meat for later use. C. Key: Refrigerated transport of food improves people's access to fresh food. D. Using stoves allows people to heat and prepare food.

2. Use the food web below to answer the question.

Food Web



Cold temperatures reduced the snake population in this food web. How will the hawks **most likely** respond to this change in their environment?

A. The hawks will hibernate.

B. The hawks will eat more deer mice.

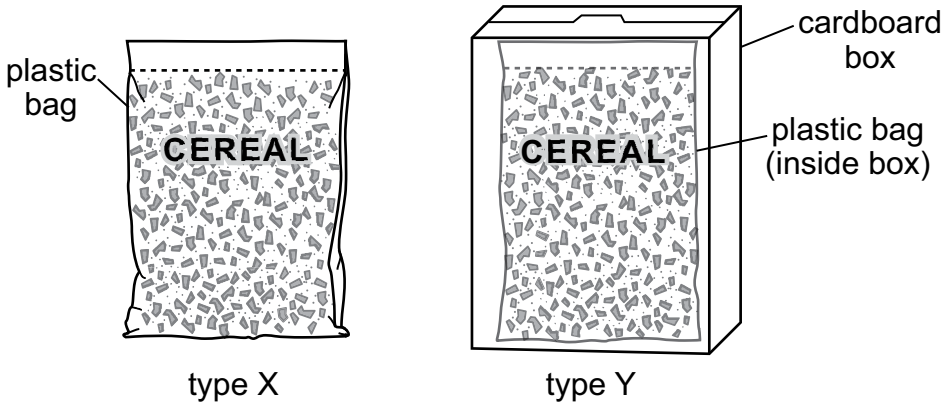
C. The hawks will feed on wheat plants.

D. The hawks will use sunlight to produce energy.

Item Information	
Alignment	S4.A.1.3.4
Answer Key	B
Depth of Knowledge	2
p-value A	17%
p-value B	62% (correct answer)
p-value C	11%
p-value D	10%
Option Annotations	A. Hawks do not hibernate. B. Key: With fewer snakes available to eat, the hawks will eat more deer mice. C. Hawks are carnivores; they do not eat plants. D. Producers, not hawks, use sunlight to produce energy.

3. Use the drawing below to answer the question.

Types of Breakfast Cereal Packaging



Breakfast cereals are usually packaged in one of two ways. Which statement **best** compares these two types of packaging?

A. Type X produces less waste than type Y.

B. Type X costs more to produce than type Y.

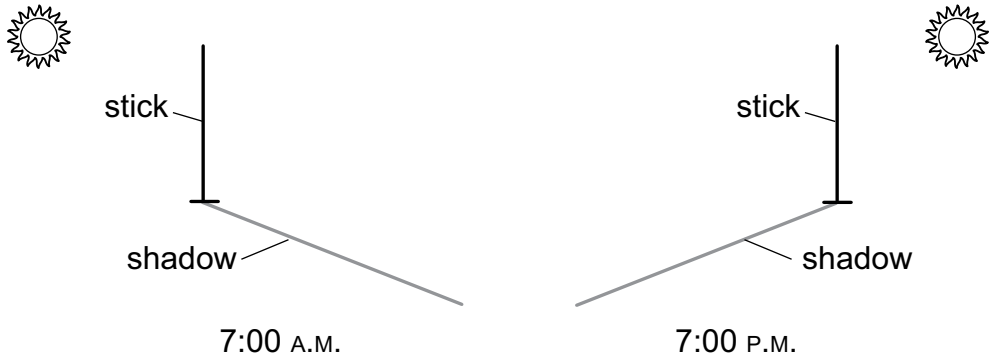
C. Type X helps keep cereal fresh longer than type Y.

D. Type X protects cereal better during shipping than type Y.

Item Information	
Alignment	S4.A.1.3.5
Answer Key	A
Depth of Knowledge	2
p-value A	66% (correct answer)
p-value B	10%
p-value C	14%
p-value D	10%
Option Annotations	A. Key: Without the cardboard box, type X produces less waste than type Y. B. Type X uses fewer resources for packaging, which reduces costs. C. Type Y has more packaging, which means type Y may keep cereal fresh longer than type X. D. Type Y has more packaging, which means type Y may protect cereal better than type X.

4. Use the drawings below to answer the question.

Shadows



When is the next time that the shadow will look **most** similar to the shadow at 7:00 A.M.?

A. 5:00 A.M. the next morning

B. 7:00 A.M. the next morning

C. 5:00 P.M. the next evening

D. 7:00 P.M. the next evening

Item Information	
Alignment	S4.A.2.1.3
Answer Key	B
Depth of Knowledge	2
p-value A	11%
p-value B	57% (correct answer)
p-value C	9%
p-value D	23%
Option Annotations	A. A shadow at 5:00 A.M. will be shorter than the shadow at 7:00 A.M. B. Key: A shadow at 7:00 A.M. the next morning will be most similar to a shadow at the same time on the previous day. C. Evening shadows appear on the opposite side of the stick than in the morning. D. A shadow at 7:00 P.M. will be on the opposite side of the stick than the shadow at 7:00 A.M.

5. Use the table below to answer the question.

Number of Hawks Observed during Four Days in August

Day	Number of Hawks Observed		
	Sharp-Shinned Hawk	Broad-Winged Hawk	Red-Tailed Hawk
1	2	3	2
2	0	0	0
3	0	11	4
4	6	14	1

Bird watchers at Hawk Mountain Sanctuary in Pennsylvania recorded the number of hawks observed during four days in August. Which conclusion can **best** be made from the data?

A. The greatest number of hawks was observed on day 4.

B. Broad-winged hawks fly faster than other types of hawks.

C. More red-tailed hawks were observed than sharp-shinned hawks.

D. Migrating hawks prefer Hawk Mountain Sanctuary over other bird sanctuaries.

Item Information	
Alignment	S4.A.2.1.4
Answer Key	A
Depth of Knowledge	3
p-value A	67% (correct answer)
p-value B	13%
p-value C	10%
p-value D	10%
Option Annotations	A. Key: Twenty-one hawks were observed on day 4, which is more than any other day. B. These data do not compare flight speed of different types of hawks. C. Observers counted 8 sharp-shinned hawks and 7 red-tailed hawks. D. These data do not compare hawk observations from other bird sanctuaries.

6. Use the chart below to answer the question.

Parts of a Pond Ecosystem

Part	Living or Nonliving?	Role in the System
water	living	provides oxygen
fish	living	consumer
algae	nonliving	producer
snail	nonliving	recycles matter

Which part of the pond ecosystem is correctly described in the chart?

A. water

B. algae

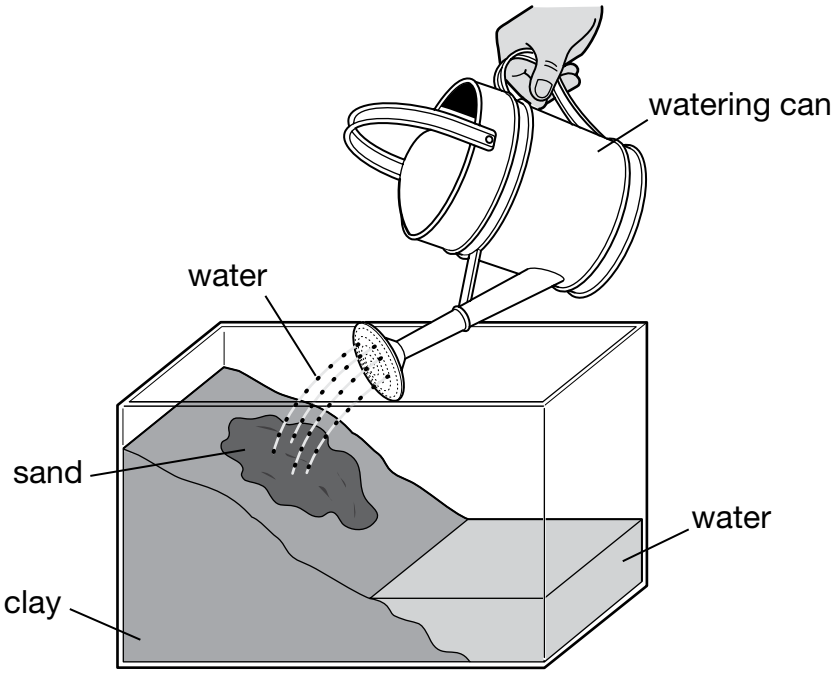
C. snail

D. fish

Item Information	
Alignment	S4.A.3.1.3
Answer Key	D
Depth of Knowledge	2
p-value A	17%
p-value B	13%
p-value C	4%
p-value D	66% (correct answer)
Option Annotations	A. Water is a nonliving part of an ecosystem. B. Algae are a living part of an ecosystem. C. A snail is a living part of an ecosystem. D. Key: Fish are living consumers in a pond ecosystem.

7. Use the drawing below to answer the question.

Water Cycle Model



A student builds a model to show some of the steps in the water cycle. Which steps in the water cycle is the student **most likely** modeling?

A. precipitation and runoff

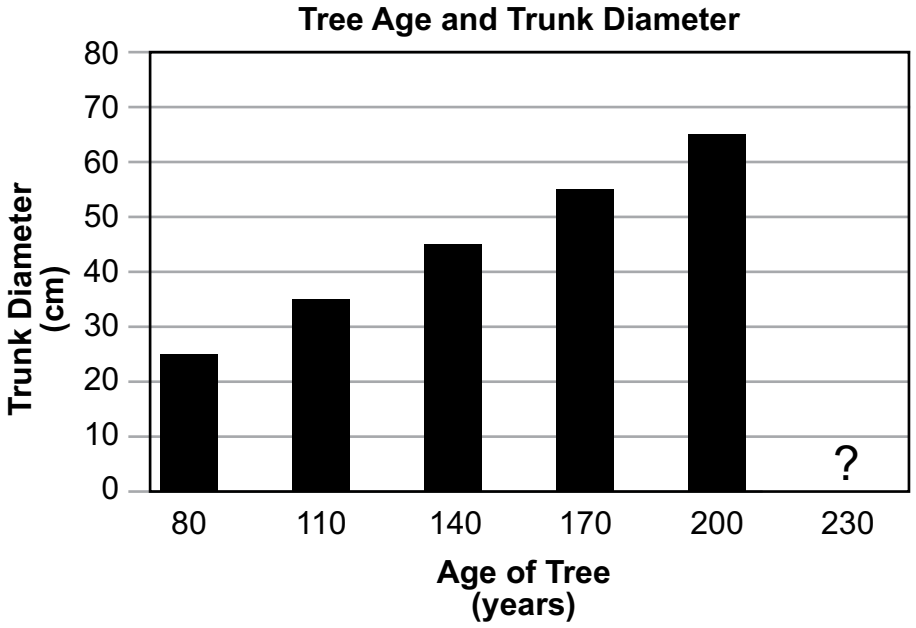
B. runoff and condensation

C. evaporation and precipitation

D. condensation and evaporation

Item Information	
Alignment	S4.A.3.2.2
Answer Key	A
Depth of Knowledge	3
p-value A	46% (correct answer)
p-value B	18%
p-value C	22%
p-value D	14%
Option Annotations	A. Key: This model shows water sprinkling out of a can (precipitation) and water flowing across the sand surface (runoff). B. This model shows runoff but does not show condensation. C. This model shows precipitation but does not show evaporation. D. This model shows neither condensation nor evaporation.

8. Use the graph below to answer the question.



About how much will the diameter of the tree's trunk **most likely** increase between year 200 and year 230?

A. 1 cm

B. 10 cm

C. 25 cm

D. 50 cm

Item Information	
Alignment	S4.A.3.3.2
Answer Key	B
Depth of Knowledge	2
p-value A	6%
p-value B	53% (correct answer)
p-value C	20%
p-value D	21%
Option Annotations	A. The pattern suggests the tree will grow 1 cm in diameter every 3 years. B. Key: The pattern suggests the tree will grow 10 cm in diameter over 30 years. C. It takes the tree approximately 75 years to increase its diameter by 25 cm. D. It takes the tree approximately 150 years to increase its diameter by 50 cm.

9. Which physical characteristic can be passed on to offspring?

A. long beard

B. strong arm

C. pierced ear

D. brown hair

Item Information	
Alignment	S4.B.2.2.1
Answer Key	D
Depth of Knowledge	2
p-value A	15%
p-value B	27%
p-value C	10%
p-value D	48% (correct answer)
Option Annotations	A. A long beard is a characteristic acquired during a person's lifetime; it is not genetic nor can it be passed from parents to offspring. B. Arm strength is acquired during a person's lifetime; it is not genetic nor is it passed from parents to offspring. C. A pierced ear is a characteristic acquired during a person's lifetime, it is not genetic nor can it be passed from parents to offspring. D. Key: Hair color is a genetic trait that is passed from parents to offspring.

10. Erie National Wildlife Refuge has many creeks, ponds, and marshes. It attracts over 200 types of birds. Which birds depend **most** on the water in the refuge?

A. birds that eat fish

B. birds that hibernate

C. birds that eat snakes

D. birds that build nests

Item Information	
Alignment	S4.B.3.1.2
Answer Key	A
Depth of Knowledge	2
p-value A	78% (correct answer)
p-value B	7%
p-value C	4%
p-value D	11%
Option Annotations	A. Key: Birds that eat fish depend on water habitats to support the fish. B. Hibernation reduces an organism's need for food or water. C. Birds that eat snakes depend on their eyesight and talons for survival. D. Birds that build nests depend on nesting materials and protective cover.

11. Which sequence shows the **most likely** steps humans use to produce lumber from trees for construction purposes?

A. growing → harvesting → shipping → processing → planting

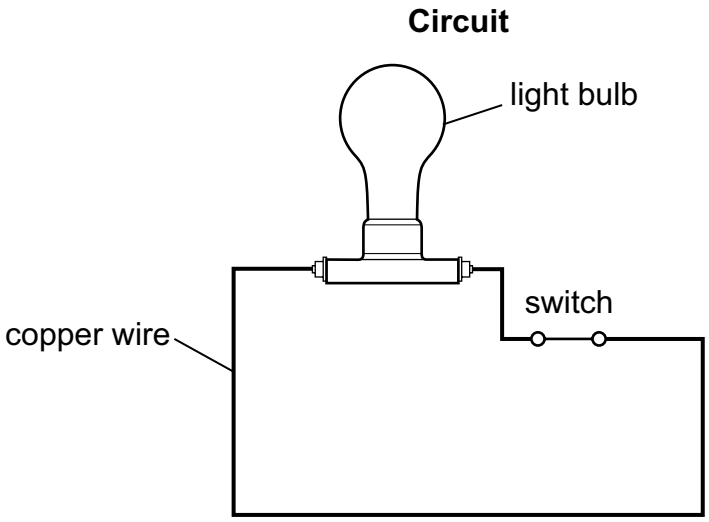
B. planting → harvesting → growing → shipping → processing

C. growing → shipping → processing → planting → harvesting

D. planting → growing → harvesting → processing → shipping

Item Information	
Alignment	S4.B.3.3.2
Answer Key	D
Depth of Knowledge	2
p-value A	10%
p-value B	10%
p-value C	6%
p-value D	74% (correct answer)
Option Annotations	A. Planting is the first step required to produce lumber from trees. B. During lumber production, growing occurs before harvesting and processing occurs before shipping. C. Planting is the first step required to produce lumber from trees. D. Key: This sequence shows how humans produce lumber from trees.

12. Use the diagram below to answer the question.



Which change is necessary for this circuit to work?

A. Add a source of power.

B. Add a second light bulb.

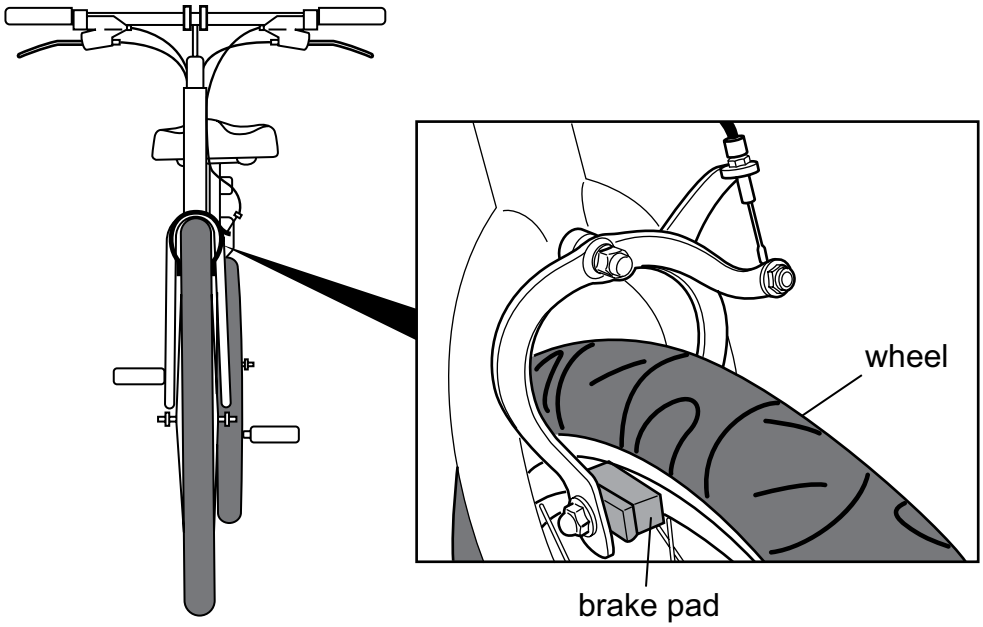
C. Move the switch farther away from the light bulb.

D. Replace the copper wire with a different type of metal wire.

Item Information	
Alignment	S4.C.2.1.3
Answer Key	A
Depth of Knowledge	2
p-value A	66% (correct answer)
p-value B	7%
p-value C	10%
p-value D	17%
Option Annotations	A. Key: A working circuit requires a power source to provide electric current. B. Adding a second light bulb simply increases the load in the circuit. C. Moving the switch farther from the light bulb does not affect circuit function. D. Copper wire is an effective electrical conductor in a circuit.

13. Use the drawing below to answer the question.

Bicycle Brake



Some bicycles have brake pads that squeeze the sides of the wheels. Which statement **best** describes how the motion of a bicycle changes when the brakes are used?

A. The bicycle speeds up due to the friction between the brake pad and the wheel.

B. The bicycle slows down due to the friction between the brake pad and the wheel.

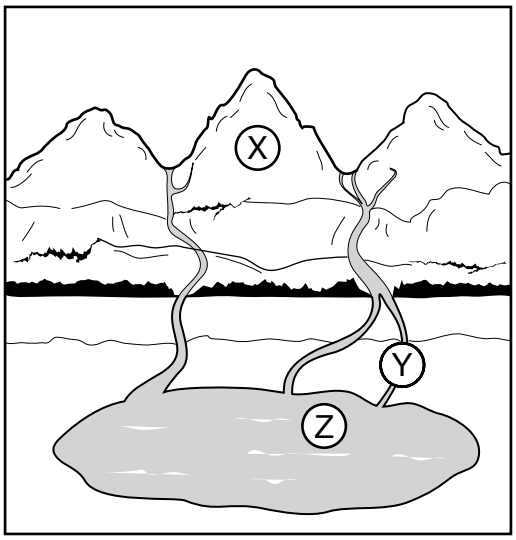
C. The bicycle speeds up due to the magnetism between the brake pad and the wheel.

D. The bicycle slows down due to the magnetism between the brake pad and the wheel.

Item Information	
Alignment	S4.C.3.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	7%
p-value B	73% (correct answer)
p-value C	4%
p-value D	16%
Option Annotations	A. Frictional force reduces, not increases, the speed of the bicycle. B. Key: Frictional force between the brake pad and the wheel causes the bicycle to slow down. C. Frictional force is produced when brake pads squeeze the sides of the wheel. D. Frictional force is produced when brake pads squeeze the sides of the wheel.

14. Use the drawing and chart below to answer the question.

Environment



Features of an Environment

Feature	Student 1	Student 2	Student 3	Student 4
X	valley	mountain	valley	mountain
Y	peninsula	river	peninsula	river
Z	watershed	lake	lake	watershed

Which student correctly labeled the environmental features?

A. student 1

B. student 2

C. student 3

D. student 4

Item Information	
Alignment	S4.D.1.1.2
Answer Key	B
Depth of Knowledge	2
p-value A	8%
p-value B	63% (correct answer)
p-value C	8%
p-value D	21%
Option Annotations	A. This student incorrectly labeled all the environmental features. B. Key: This student correctly labeled feature X (mountain), feature Y (river), and feature Z (lake) in this environment. C. This student correctly labeled feature Z, which is a lake. D. This student correctly labeled feature X (mountain) and feature Y (river).

15. Which statement **best** describes a pond?

A. It is made of salt water that is frozen.

B. It is made of salt water that is flowing.

C. It is made of fresh water that does not flow.

D. It is made of fresh water that does not freeze.

Item Information	
Alignment	S4.D.1.3.3
Answer Key	C
Depth of Knowledge	2
p-value A	5%
p-value B	15%
p-value C	71% (correct answer)
p-value D	9%
Option Annotations	A. A pond is made of fresh water. B. A pond is a standing body of fresh water. C. Key: A pond is a standing body of fresh water. D. A pond is made of fresh water, but it can freeze in low temperatures.

16. In late spring, a student notices very tall, puffy clouds forming quickly in the sky. The clouds seem to be getting taller and are turning dark gray. Which weather forecast can **best** be made from these observations?

A. Cirrus clouds are forming and fair weather is expected.

B. Cumulus clouds are forming and dry, cold weather is expected.

C. Cumulonimbus clouds are forming and a thunderstorm is likely.

D. Stratus clouds are forming and a late-season snowstorm is likely.

Item Information	
Alignment	S4.D.2.1.1
Answer Key	C
Depth of Knowledge	2
p-value A	9%
p-value B	9%
p-value C	74% (correct answer)
p-value D	8%
Option Annotations	A. Cirrus clouds, often seen in fair weather, are long, thin, wispy, and white. B. Cumulus clouds are puffy white or light gray and look like cotton balls. C. Key: Cumulonimbus clouds are thunderstorm clouds—they grow tall and become dark gray before producing severe weather events. D. Stratus clouds are gray and form low to the ground, covering most of the sky.

OPEN-ENDED ITEM

17. Use the information below to answer the question.

Objects

- horse-drawn wagon
- bicycle
- automobile
- train
- airplane
- boat

A student made a list of some objects.

Part A: Describe one similarity shared by all the objects in the list.

_____

_____

Part B: Choose one of the objects from the list and describe a positive **or** a negative impact it has had on society or the environment.

Object: _____

Description of Positive or Negative Impact: _____

_____

_____

_____

SCORING GUIDE

#17 Item Information

Alignment	S4.A.1.1.2	**Depth of Knowledge**	2	**Mean Score**	1.34

Item-Specific Scoring Guideline

Score	Description
2	The response demonstrates a *thorough* understanding of how to identify and describe examples of common technological changes past to present in the community (e.g., energy production, transportation, communications, agriculture, packaging materials) that have either positive or negative impacts on society or the environment by • describing one similarity shared by all objects in the list **and** • describing a positive or negative impact one of the objects from the list had on society or the environment. The response is clear, complete, and correct.
1	The response demonstrates a *partial* understanding of how to identify and describe examples of common technological changes past to present in the community (e.g., energy production, transportation, communications, agriculture, packaging materials) that have either positive or negative impacts on society or the environment by • describing one similarity shared by all objects in the list **or** • describing a positive or negative impact one of the objects from the list had on society or the environment. The response may contain some work that is incomplete or unclear.
0	The response provides *insufficient* evidence to demonstrate any understanding of the concept being tested.

Note: No deductions should be taken for misspelled words or grammatical errors.

Responses that will receive credit (responses are not limited to these examples):

Part A (1 point):

- All of the objects are used for travel/transportation.
- All of the objects were invented by people.
- All of the objects make work easier for people.
- All of the objects can transport people and things from one place to another.
- All of the objects can change speed.
- Any other reasonable description of a similarity shared by all of the objects

Part B (1 point):

Positive Impact:

- faster transportation of food to prevent spoilage (all)
- ability to carry heavy objects from place to place (all)
- ability to travel over water (boat, airplane)
- ability to transport medicine to people
- ability to travel over mountains (train, wagon, airplane)
- ability to transport people over great distances (all)
- ability to move faster (all)
- any other description of a positive effect one of the objects has had on society

Negative Impact:

- uses a lot of land to build roads, tracks, airports,…etc. (all)
- Metals and other materials have to be mined, which can harm the environment. (all)
- Most fuels come from nonrenewable resources. (all but wagon and bicycle)
- Fossil fuels can add pollution to the atmosphere. (all but wagon and bicycle)
- Engines can produce noise pollution.
- Animals may be struck. (automobile, train, airplane, boat)
- Animal migratory paths can be blocked by roads and tracks. (wagon, bicycle, car, train)
- Any other description of a negative effect one of the objects has had on society

STUDENT RESPONSE

Response Score: 2 points

17. Use the information below to answer the question.

Objects

- horse-drawn wagon
- bicycle
- automobile
- train
- airplane
- boat

A student made a list of some objects.

Part A: Describe one similarity shared by all the objects in the list.

They are all used for transport.

Part B: Choose one of the objects from the list and describe a positive **or** a negative impact it has had on society or the environment.

Object: airplane

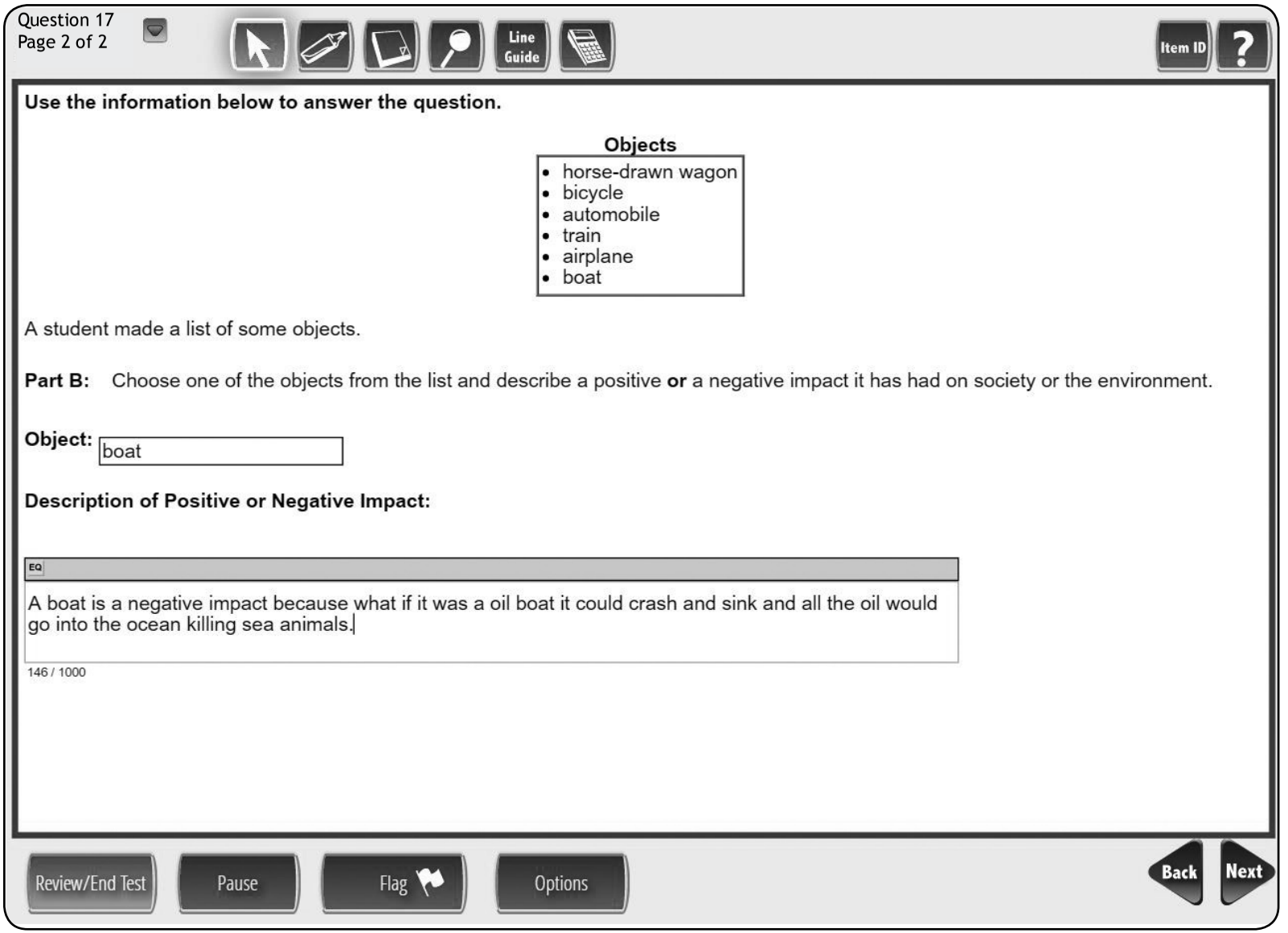
Description of Positive or Negative Impact: A positive impact an airplane has is that it is vary fast and it can transport people vary fast.

The response demonstrates a *thorough* understanding of how to identify and describe examples of common technological changes past to present in the community that have either positive or negative impacts on society or the environment. In Part A, the response correctly describes one similarity shared by all of the objects in the list: *"They are all used for transport."* In Part B, the response has an object selected from the list (*"airplane"*) and has correctly described a positive impact the object had on society or the environment: *"it is vary fast and it can transport people vary fast."* The response is clear, complete, and correct.

STUDENT RESPONSE

Response Score: 1 point

PART A



The response demonstrates a *partial* understanding of how to identify and describe examples of common technological changes past to present in the community that have either positive or negative impacts on society or the environment. In Part A, the response: *"A bicycle and a horse-drawn wagon don't need power to move"* does not describe a similarity shared by all of the objects in the list and does not receive any credit. In Part B, the response has an object selected from the list (*"boat"*) and has correctly described a negative impact the object had on society or the environment: *"a oil boat it could crash and sink and all the oil would go into the oceon killing sea animals."* The response contains some work that is incomplete or unclear.

STUDENT RESPONSE

Response Score: 0 points

17. Use the information below to answer the question.

Objects

- horse-drawn wagon
- bicycle
- automobile
- train
- airplane
- boat

A student made a list of some objects.

Part A: Describe one similarity shared by all the objects in the list.

A bicycle and train are similarity.

Part B: Choose one of the objects from the list and describe a positive **or** a negative impact it has had on society or the environment.

Object: bicycle

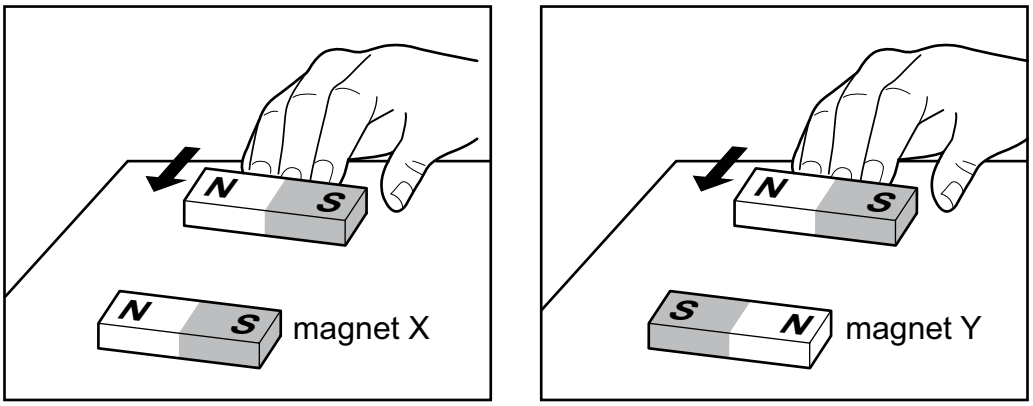
Description of Positive or Negative Impact: You cant cary a bicycle you ride it.

The response provides *insufficient* evidence to demonstrate any understanding of how to identify and describe examples of common technological changes past to present in the community that have either positive or negative impacts on society or the environment. In Part A, the response: *"A bicycle and train are similarity"* does not describe a similarity shared by all objects in the list and does not receive any credit. In Part B, the response has an object selected from the list (*"bicycle"*), but the response: *"You cant cary a bicycle you ride it"* is not a valid description of a positive or negative impact and does not receive any credit.

OPEN-ENDED ITEM

18. Use the drawings below to answer the question.

Bar Magnet Investigation



A student pushes a bar magnet across a tabletop toward magnet X. The student repeats this action toward magnet Y.

Part A: Predict the motion of magnet X.

Part B: Predict the motion of magnet Y.

AFTER YOU HAVE CHECKED YOUR WORK, CLOSE YOUR ANSWER BOOKLET AND TEST BOOKLET SO YOUR TEACHER WILL KNOW YOU ARE FINISHED.

STOP

SCORING GUIDE

#18 Item Information

Alignment	S4.C.3.1.1	**Depth of Knowledge**	3	**Mean Score**	0.98

Item-Specific Scoring Guideline

Score	Description
2	The response demonstrates a *thorough* understanding of changes in motion caused by forces (e.g., magnetic, pushes or pulls, gravity, friction) by • predicting the motion of magnet X when the student's bar magnet is pushed toward it **and** • predicting the motion of magnet Y when the student's bar magnet is pushed toward it. The response is clear, complete, and correct.
1	The response demonstrates a *partial* understanding of changes in motion caused by forces (e.g., magnetic, pushes or pulls, gravity, friction) by • predicting the motion of magnet X when the student's bar magnet is pushed toward it **or** • predicting the motion of magnet Y when the student's bar magnet is pushed toward it. The response may contain some work that is incomplete or unclear.
0	The response provides *insufficient* evidence to demonstrate any understanding of the concept being tested.

Note: No deductions should be taken for misspelled words or grammatical errors.

Responses that will receive credit (responses are not limited to these examples):

Part A (1 point):

- Magnet X will move away from the student's magnet.
- The two magnets will repel each other.
- The two magnets will move away from each other.

Part B (1 point):

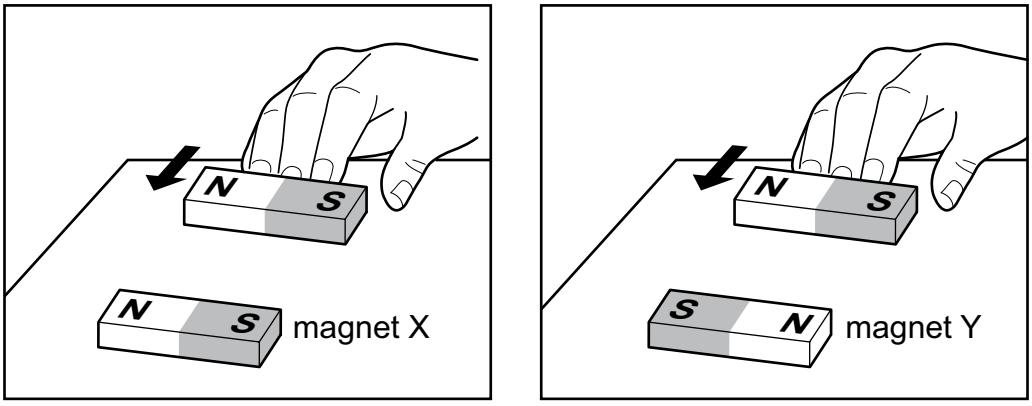
- Magnet Y will move toward the student's magnet.
- The two magnets will move toward each other.
- The two magnets will attract.

STUDENT RESPONSE

Response Score: 2 points

18. Use the drawings below to answer the question.

Bar Magnet Investigation



A student pushes a bar magnet across a tabletop toward magnet X. The student repeats this action toward magnet Y.

Part A: Predict the motion of magnet X.

The magnets will push away from each other.

Part B: Predict the motion of magnet Y.

the magnet will pull together.

The response demonstrates a *thorough* understanding of changes in motion caused by forces. In Part A, the response correctly predicts the motion of magnet X when the student's bar magnet is pushed toward it: *"The magnets will push away from each other."* In Part B, the response correctly predicts the motion of magnet Y when the student's bar magnet is pushed toward it: *"The magnet will pull together."* The response is clear, complete, and correct.

AFTER YOU HAVE CHECKED YOUR WORK, CLOSE YOUR ANSWER BOOKLET AND TEST BOOKLET SO YOUR TEACHER WILL KNOW YOU ARE FINISHED.

STOP

STUDENT RESPONSE

Response Score: 1 point

PART A

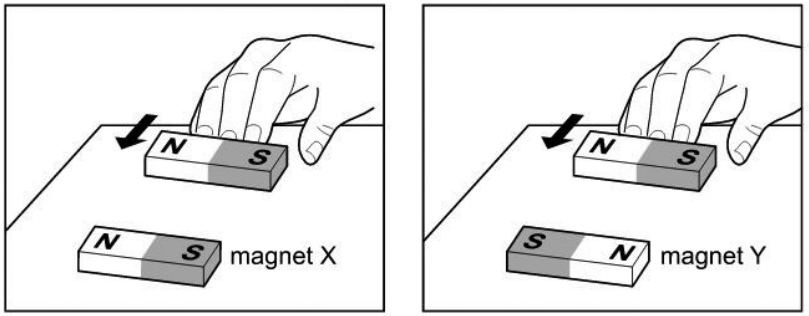
Question 18
Page 2 of 2

Line Guide

Item ID

Use the drawings below to answer the question.

Bar Magnet Investigation



A student pushes a bar magnet across a tabletop toward magnet X. The student repeats this action toward magnet Y.

Part B: Predict the motion of magnet Y.

EQ

It is a moving motion.

22 / 1000

Review/End Test | Pause | Flag | Options | Back | Next

The response demonstrates a *partial* understanding of changes in motion caused by forces. In Part A, the response correctly predicts the motion of magnet X when the student's bar magnet is pushed toward it: *"It is a repelling motion."* In Part B, the response *"It is a moving motion"* does not correctly predict the motion of magnet Y when the student's bar magnet is pushed toward it. The response in Part B is too vague to receive any credit. The response contains some work that is incomplete or unclear.

STUDENT RESPONSE

Response Score: 0 points

PART A

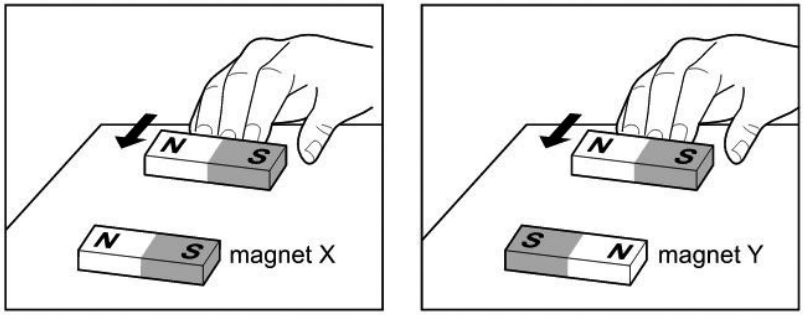
Question 18
Page 2 of 2

Line Guide

Item ID

Use the drawings below to answer the question.

Bar Magnet Investigation



A student pushes a bar magnet across a tabletop toward magnet X. The student repeats this action toward magnet Y.

Part B: Predict the motion of magnet Y.

EQ

The magnets will push against each other and they'll never touch.

65 / 1000

Review/End Test | Pause | Flag | Options | Back | Next

The response provides *insufficient* evidence to demonstrate any understanding of changes in motion caused by forces. In Part A, the response *"The magnets will keep coming closer until they stick together"* is an incorrect response. It does not correctly predict the motion of magnet X when the student's bar magnet is pushed toward it and does not receive any credit. In Part B, the response *"The magnets will push against each other and they'll never touch"* is an incorrect response. It does not correctly predict the motion of magnet Y when the student's bar magnet is pushed toward it and does not receive any credit.

SAMPLE ITEM SUMMARY

MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	*p*-values A	*p*-values B	*p*-values C	*p*-values D
1	S4.A.1.1.2	C	2	14%	9%	53%	24%
2	S4.A.1.3.4	B	2	17%	62%	11%	10%
3	S4.A.1.3.5	A	2	66%	10%	14%	10%
4	S4.A.2.1.3	B	2	11%	57%	9%	23%
5	S4.A.2.1.4	A	3	67%	13%	10%	10%
6	S4.A.3.1.3	D	2	17%	13%	4%	66%
7	S4.A.3.2.2	A	3	46%	18%	22%	14%
8	S4.A.3.3.2	B	2	6%	53%	20%	21%
9	S4.B.2.2.1	D	2	15%	27%	10%	48%
10	S4.B.3.1.2	A	2	78%	7%	4%	11%
11	S4.B.3.3.2	D	2	10%	10%	6%	74%
12	S4.C.2.1.3	A	2	66%	7%	10%	17%
13	S4.C.3.1.1	B	2	7%	73%	4%	16%
14	S4.D.1.1.2	B	2	8%	63%	8%	21%
15	S4.D.1.3.3	C	2	5%	15%	71%	9%
16	S4.D.2.1.1	C	2	9%	9%	74%	8%

OPEN-ENDED

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	S4.A.1.1.2	2	2	1.34
18	S4.C.3.1.1	2	3	0.98

THIS PAGE IS INTENTIONALLY BLANK.

PSSA Grade 4 Science
Item and Scoring Sampler