



The Pennsylvania System of School Assessment



2005–2006
Science Item and Scoring Sampler
Grade 4

Pennsylvania Department of Education Bureau of Assessment and Accountability 2005–2006

TABLE OF CONTENTS

Introduction	3
General Description of 2-point Science Scoring Guidelines	4
Science Reporting Categories	5
Grade 4 Science Multiple-Choice Items	6
Grade 4 Open-Ended Item	14
Item-Specific Scoring Guide	15

INTRODUCTION

General Introduction

The Department of Education provides districts and schools with tools to assist in delivering focused instructional programs aligned to the state assessment system. These tools include assessment anchor documents, assessment handbooks, and content-based item and scoring samplers. This 2005–2006 Science Item and Scoring Sampler is a useful tool for Pennsylvania educators in the preparation of local instructional programs and the statewide PSSA assessments.

What's Included

This item and scoring sampler contains science multiple-choice and open-ended items. These items are examples of science items that may be used to assess student performance on the PSSA. These items provide an idea of the types of items that will appear on the operational Spring 2008 PSSA. Each item has been through a rigorous review process to ensure alignment with the Assessment Anchors and State Standards, but they have not been reviewed by Pennsylvania teachers or administered in Pennsylvania schools.

Purpose and Uses

The items in this sampler may be used as examples for creating assessment items at the classroom level, and they may also be copied and used as part of a local instructional program.* Classroom teachers may find it beneficial to have students respond to the open-ended item in the sampler. Educators can then use the sampler as a guide to score the responses either independently or together with colleagues within a school or district.

Item Format and Scoring Guidelines

The multiple-choice items have four answer choices. A correct response to each multiple-choice item is worth 1 point.

Each short open-ended (SOE) item is designed to take about ten minutes to complete. However, during an actual testing event students are given additional time as necessary to complete the test items. The open-ended items in science are scored with item-specific scoring guides on a 0–2 scale. An item-specific scoring guide is presented within this sampler and is similar to those which will be used to score open-ended items in future PSSA science assessments.

Also included is the General Description of Scoring Guidelines used to develop the item-specific guides. The General Description of Scoring Guidelines should be used to develop any item-specific scoring guides created for use within local instructional programs.*

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

GENERAL DESCRIPTION OF 2-POINT SCIENCE SCORING GUIDELINES:

- 2 – 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– 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 – 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.

Special Categories within zero reported separately:

- BLK – Blank, entirely erased, or written refusal to respond
- OT – Off task
- IL – Illegible
- LOE – Response in a language other than English

SCIENCE REPORTING CATEGORIES

Science scores are reported in four categories:

- A** – The Nature of Science
- B** – Biological Sciences
- C** – Physical Sciences
- D** – Earth and Space Sciences

Sample Items

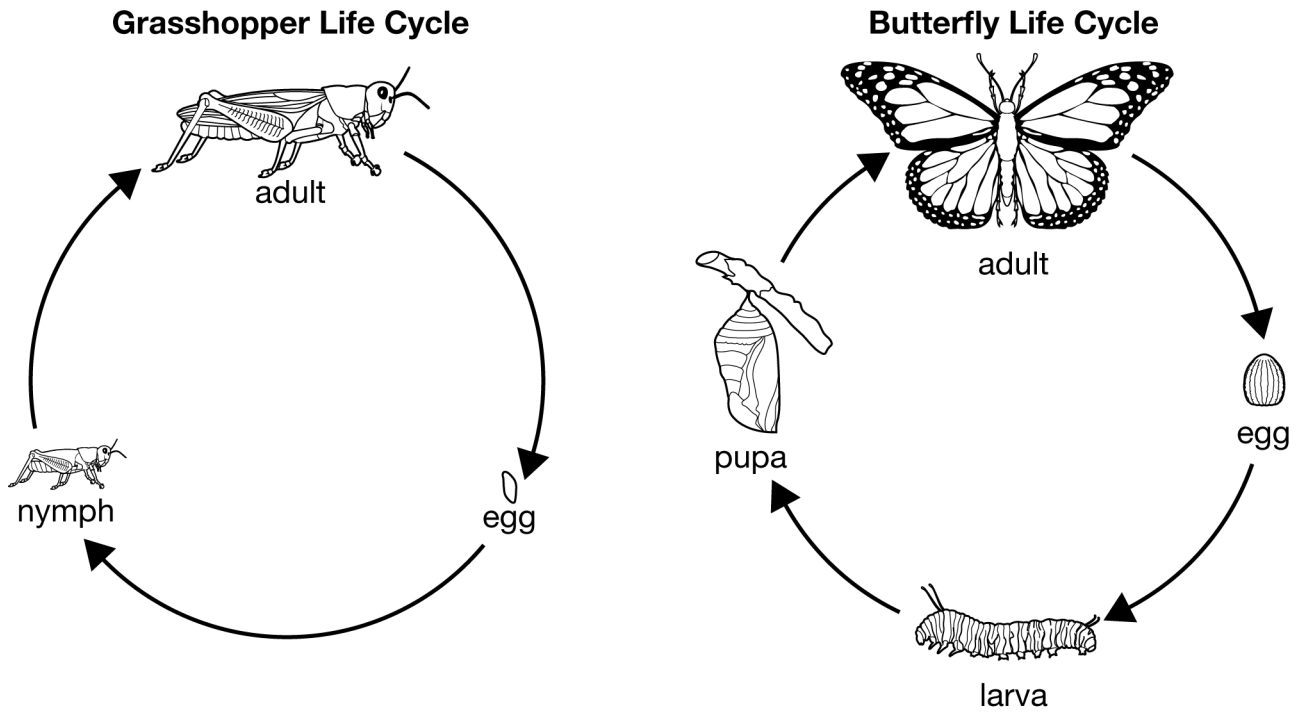
The science stand-alone multiple-choice items begin on page 6. Each item is preceded by the Assessment Anchor and eligible content coding. Answer options A–D are followed by a brief analysis or rationale. The correct answer is indicated by an asterisk (*).

One stand-alone 2-point SOE item follows the multiple-choice items. It is displayed with an item-specific scoring guide and samples of responses with scores and annotations.

SCIENCE

B.1.1.5

Use the diagrams below to answer question 1.



1. Which statement correctly compares these life cycles?

- A Butterflies lay eggs and grasshoppers do not lay eggs.
- B Butterflies have wings throughout their life cycle and grasshoppers do not.
- C Butterflies have more legs as adults than do grasshoppers as adults.
- D Butterflies go through more body-shape changes than do grasshoppers.*

- A *Butterflies and grasshoppers both lay eggs.*
- B *Neither butterflies nor grasshoppers have wings throughout their life cycles.*
- C *Butterflies and grasshoppers both have six legs.*
- D *Key: Butterflies go through one more body-shape change than do grasshoppers.*

SCIENCE

A.2.1.1

Use the table below to answer question 2.

Plant Experiment Information

Plant	Room Temperature	Location	Daily Amount of Water	Soil Type
1	22°C / 72°F	by bright window	20 mL	equal mixture sand and clay
2	22°C / 72°F	in dark closet	20 mL	equal mixture sand and clay

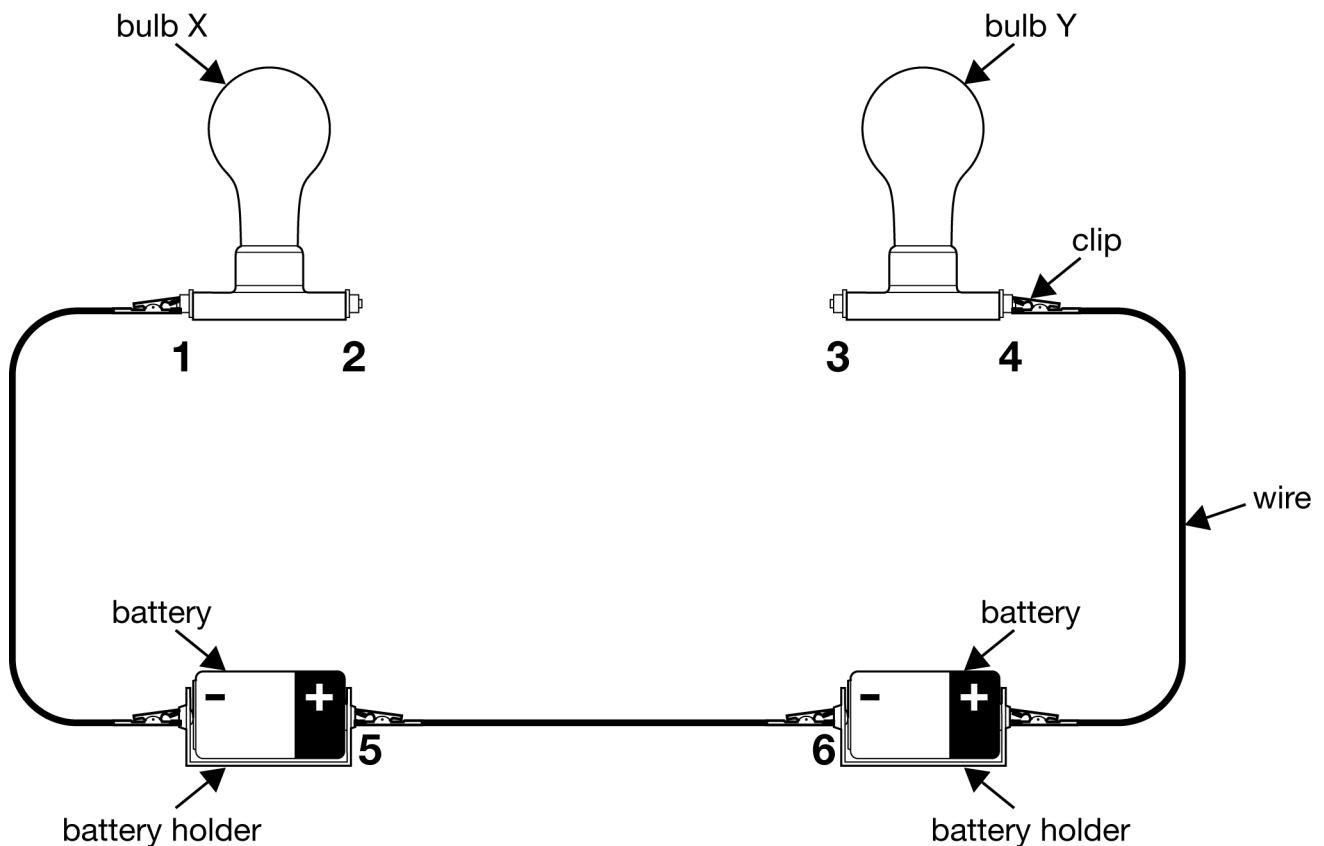
2. A student set up an experiment with bean plants. The table shows information from the experiment. Which question **best** describes what the student was trying to answer?
- A How does cold air affect bean plant growth?
 - B How does the amount of light affect bean plant growth? *
 - C How does the soil moisture affect bean plant growth?
 - D How does sand affect bean plant growth?

- A Both plants were exposed to the same temperature, 22°C (72°F). This is not a variable that was tested.
- B Key: The only condition that changed in this experiment was the amount of light exposure for each plant. Light exposure is the variable that was tested.
- C Both plants received 20 mL of water daily. The amount of water is not a variable that was tested.
- D Both plants were planted in soil with equal amounts of sand and clay. This is not a variable that was tested.

SCIENCE

C.2.1.3

Use the experimental setup below to answer question 3.



3. A student wants to complete the circuit to make **only** bulb X light up. Where could a wire be attached?

- A point 1 and point 5
- B point 2 and point 3
- C point 2 and point 5 *
- D point 3 and point 6

- A If the student connects point 1 and 5, the circuit is not completed. Neither bulb will light up.
- B If the student connects points 2 and 3, both bulbs will light up.
- C Key: By connecting points 2 and 5, a complete circuit is created. Only bulb X will light up.
- D By connecting points 3 and 6, a complete circuit is formed. However, bulb Y will light up, not bulb X.

SCIENCE

B.2.2.1

4. Which example is a physical feature that is passed on to offspring?

- A talking
- B walking
- C sharp beak *
- D loose tooth

- A *Talking is a learned behavior.*
- B *Walking is a learned behavior.*
- C *Key: A sharp beak is a physical feature that is inherited.*
- D *Straight or crooked teeth are inherited traits, but loose teeth are due to either the growth process or an accident.*

D.3.1.2

5. Which example requires one Earth year to complete?

- A Earth rotating once on its axis
- B Earth revolving once around the Sun *
- C the Sun rotating once on its axis
- D the Sun revolving once around Earth

- A *Earth rotates on its axis once every 23 hours and 56 minutes.*
- B *Key: A year is the amount of time it takes Earth to revolve around the Sun one time.*
- C *The Sun rotates on its axis approximately once every 27 Earth days at its equator. Near its north and south poles rotation takes longer, approximately 35 Earth days.*
- D *The Sun does not revolve around Earth. Earth revolves around the Sun.*

B.3.3.3

6. Which animal **most likely** competes with humans for grain?

- A mouse *
- B hawk
- C spider
- D wolf

- A *Key: A mouse is an omnivore. It will eat grain.*
- B *A hawk is a carnivore. It will eat the mouse, but not grain.*
- C *A spider is a carnivore. It does not consume grain.*
- D *A wolf is usually a carnivore. It does not compete with humans for grain.*

D.1.3.2

7. In which example is water vapor condensing?

- A water leaking from a faucet
- B water in a freezer changing to ice
- C water collecting on a leaf on a cool night *
- D water in a puddle changing to gas during a hot day

- A *Water leaking from a faucet is an example of liquid water moving.*
- B *Water changing to ice in a freezer is an example of a phase change, but it is not condensation.*
- C *Key: The water that collects on a leaf on a cool night is an example of a phase change. Water vapor condenses into liquid water drops (dew) on a cooler surface.*
- D *Water in a puddle changing to a gas during a hot day is an example of a phase change, but it is not condensation.*

SCIENCE

C.1.1.2

Use the illustrations below to answer question 8.

Box of Objects

Student 1

group 1

group 2

Student 2

group 1

group 2

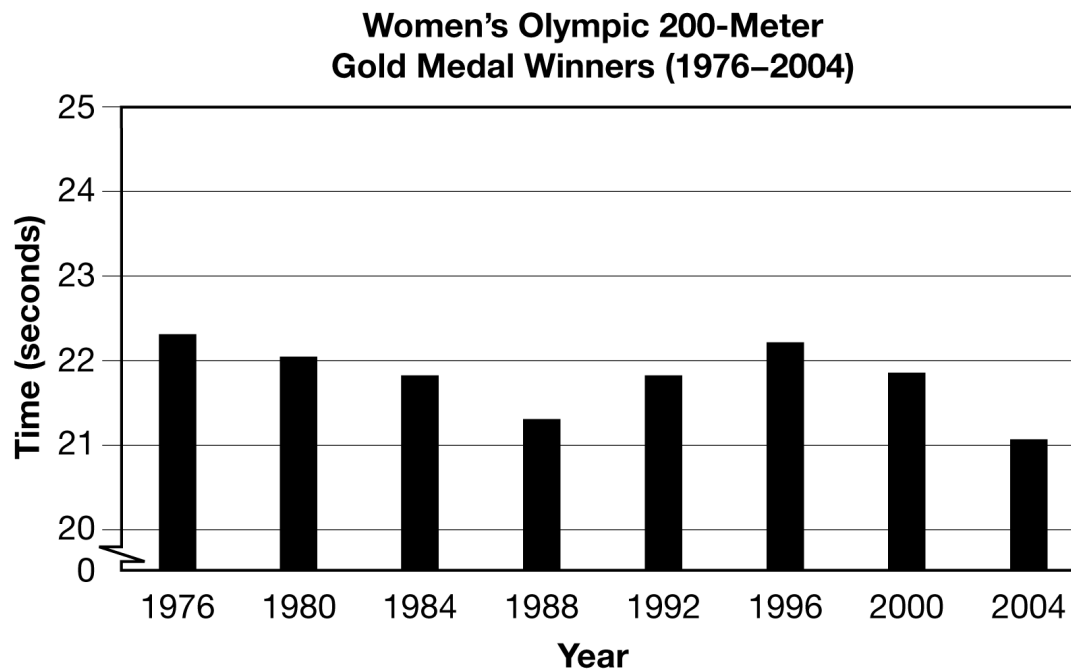
8. A teacher had a box of objects. Two students put the objects into different groups based on a feature of the objects. The students grouped the objects in different ways. Which pair correctly describes how the students grouped the objects?
- A student 1: objects that are metals and objects that are not
student 2: objects that are food and objects that are not
 - B student 1: objects that are food and objects that are not
student 2: objects that have round shapes and objects that do not
 - C student 1: objects that have round shapes and objects that do not
student 2: objects that hold materials together and objects that do not *
 - D student 1: objects that hold materials together and objects that do not
student 2: objects that are metals and objects that are not

SCIENCE

- A Student 1 placed metal objects in both groups. Student 2 placed edible objects in only one group.
- B Student 1 placed inedible objects in both groups. Student 2 placed round-shaped objects in both groups.
- C Key: Student 1 placed all the round objects in group 1 and all other objects in group 2. Student 2 placed all fasteners in group 2 and all other objects in group 1.
- D Student 1 placed fasteners in both groups. Student 2 placed metal objects in both groups.

A.2.1.4

Use the graph below to answer question 9.



9. Which statement is a correct conclusion about the data in the graph?

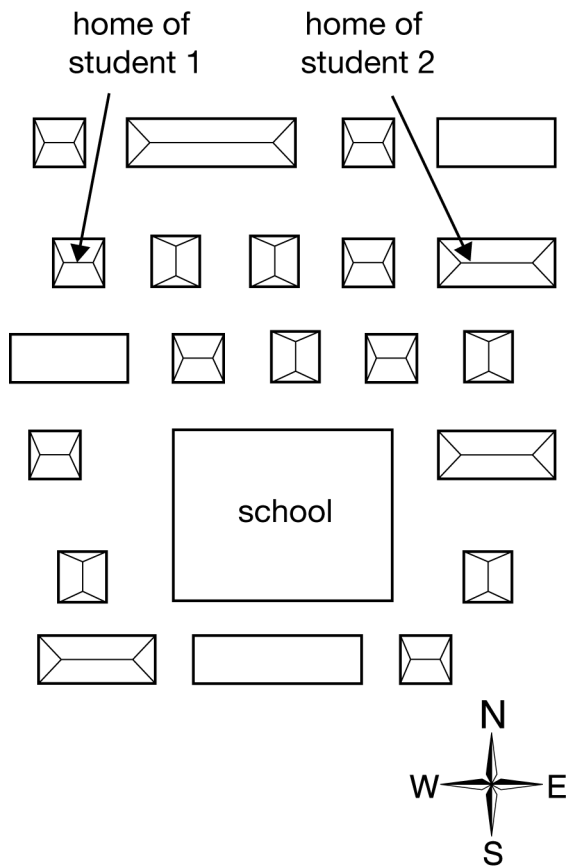
- A The fastest race time shown was in 1976.
- B The slowest race time shown was in 2004.
- C Race times decreased between 1980 and 1988. *
- D Race times decreased between 1992 and 2004.

- A According to the graph, the race time in 2004 was the fastest recorded time.
- B According to the graph, the slowest recorded race time was in 1976.
- C Key: According to the graph, race times decreased from 22 seconds in 1980 to approximately 21.8 seconds in 1984, and then to approximately 21.3 seconds in 1988.
- D Race times increased and then decreased between 1992 and 2004.

SCIENCE

C.3.1.3

Use the map to answer question 10.



10. Two students compared the locations of their homes to the location of their school. Which statement describes where the students live?

- A Student 1's home is southeast of the school and east of student 2's home.
- B Student 1's home is southwest of the school and west of student 2's home.
- C Student 2's home is northeast of the school and east of student 1's home. *
- D Student 2's home is southeast of the school and west of student 1's home.

- A Student 1's home is northwest of the school and west of student 2's home.
- B Student 1's home is northwest of the school and west of student 2's home.
- C Key: In relation to the school, student 2's home is northeast. In relation to student 1's home, student 2's home is east.
- D Student 2's home is northeast of the school and east of student 1's home.

SCIENCE

Grade 4 Open-Ended Item Begins on the Next Page

SCIENCE

D.2.1.3

This is a Short Open-Ended (SOE) question. It is worth two points.

11. A thermometer is one instrument that is used to study weather. A thermometer measures the temperature of the air.

A. Identify one **other** instrument that can be used to study weather.

B. Describe what the instrument you identified in part A measures.

SCIENCE

Item #11

This item will be reported under Category D, Earth and Space Sciences.

Assessment Anchors:

D.2.1 – Identify basic weather conditions and how they are measured.

Specific Eligible Content addressed by this item:

D.2.1.3 – Identify appropriate instruments (e.g., thermometer, rain gauge, weather vane, anemometer, barometer) to study weather and what they measure.

Scoring Guide:

Score	In response to this item, the student—
2	demonstrates a thorough understanding of instruments used to study weather by identifying one instrument (other than a thermometer) that is used to study weather and correctly describing what it measures. The response is clear, complete, and correct. The response may contain a minor blemish (e.g., misspelled words) or omission in work or explanation that does not detract from demonstrating a thorough understanding.
1	demonstrates a partial understanding of instruments used to study weather by identifying one instrument (other than a thermometer) that is used to study weather. OR The response describes, in general, parameters that weather instruments (other than a thermometer) measure but does not identify (by name) any instrument in part A. OR The response demonstrates minimal 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	provides insufficient evidence to demonstrate any understanding of instruments used to study weather. Nothing is correct, relevant, or sufficient to earn a score of one. The response may show only information copied or rephrased from the question. BLK – Blank, entirely erased, or written refusal to respond OT – Off task IL – Illegible LOE – Response in a language other than English

Scoring Guide is continued on page 16.

SCIENCE

Item #11

Top-scoring Response:

Part A Response
rain gauge

(1 score point)

1 point for correct identification.

Part B Response
A rain gauge measures the amount of rain that falls in it.

(1 score point)

1 point for correct description.

SCIENCE

Response Score: 2

11. A thermometer is one instrument that is used to study weather. A thermometer measures the temperature of the air.

A. Identify one **other** instrument that can be used to study weather.

rain gauge

The student's response in part A is correct.

B. Describe what the instrument you identified in part A measures.

A rain gauge measures the amount of rain that falls in it.

The student's response in part B is correct.

SCIENCE

Response Score: 1

11. A thermometer is one instrument that is used to study weather. A thermometer measures the temperature of the air.

A. Identify one **other** instrument that can be used to study weather.

A weather vane

The student's response in part A is correct.

B. Describe what the instrument you identified in part A measures.

A weather vane measures
the speed of the wind.

The student's response in part B is incorrect. A weather vane measures wind direction, not wind speed.

SCIENCE

Response Score: 0

11. A thermometer is one instrument that is used to study weather. A thermometer measures the temperature of the air.

A. Identify one **other** instrument that can be used to study weather.

thermometer

The student used the same tool in part A that was given in the prompt.

B. Describe what the instrument you identified in part A measures.

A thermometer measures the temperature of the air.

The student has provided no new information in part B. The student's response repeats the wording of the prompt.

