Sample Booklet
Grade 5
Science

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STAAR MASTER™

Student Practice Book
Science, Grade 5

for the State of Texas Assessments
of Academic Readiness

Teacher Guide

Lori Mammen
Editorial Director

ISBN: 978-1-60539-745-0

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What’s Inside the Student Practice Book?

The STAAR MASTER™ Student Practice Book provides practice and review material for the Grade 5 Science portion of the State of Texas Assessments of Academic Readiness (STAAR™).

- Authentic practice items reflect the content students are expected to know.
- The practice items cover a broad range of topics and ideas of interest to fifth-grade students.
- Practice items are grouped according to reporting category.
- Some practice items address multiple standards/expectations, thereby assessing in a more rigorous and authentic manner.
- More than half of the practice items incorporate investigation and reasoning skills, as appropriate.
- Each question is labeled for easy identification of the TEKS-based standard and expectation addressed in the question.
- Practice items that test investigation and reasoning skills include labels to identify the specific standard and expectation addressed in the item.
- Selected items are “griddable items,” which reflects the format used randomly throughout the actual STAAR assessment.
- Charts, graphs, and diagrams are integrated within practice items when relevant to the standards.
- Items in the STAAR MASTER Student Practice Book address the following science concepts:
  - Matter and energy
  - Force, motion, and energy
  - Earth and space
  - Organisms and environments

Practice-Item Skills Tags
Each practice item is labeled with a “skills tag” (see Figure 1) for easy identification of the TEKS-based standard and expectation addressed in the item. The tag also notes the complexity level of the item. (For more information about complexity levels, refer to “Descriptions of STAAR MASTER Complexity Levels,” page 5.)

Griddable Items
In addition to multiple-choice items, STAAR Science assessments will include open-ended questions known as “griddable items” (Texas Education Agency, 2010d). This type of assessment item allows students to determine an answer without the influence of given answer choices. The fifth-grade STAAR Science assessment will likely include three to five griddable items. The answer grid will have four columns with one column designated for a fixed decimal point (see Figure 2, below). Correct answers are positive numbers that range from 0 to 999. To indicate their answer, students must appropriately enter the number in the boxes and then fill in the corresponding bubbles. Students will not grid the units (e.g., liters). It is acceptable to grid extra zeroes that do not affect the value of the correct answer.

This Teacher Guide includes—
- an overview of the Student Practice Book and key characteristics of the STAAR
- descriptions of STAAR MASTER complexity levels
- a master list of STAAR-eligible standards and expectations addressed in the Science TEKS
- strategies for test preparation and science instruction
- a complete answer key (with corresponding complexity levels for the practice items)
Readiness vs. Supporting Standards
The eligible, or tested, TEKS are divided into “readiness standards” and “supporting standards,” with greater emphasis on the former. Readiness standards address broader, deeper ideas and are deemed more critical for students to know. Supporting standards address more narrowly defined ideas and will still be assessed, although not emphasized. The STAAR MASTER™ Student Practice Book mirrors this balance of readiness and supporting standards to provide meaningful, authentic student practice for the STAAR™ assessment.

Scientific Investigation and Reasoning Skills
For the STAAR, scientific processes and reasoning skills are not tested in isolation under a separate reporting category. These critical skills are now incorporated into at least 40% of the practice items from eligible TEKS and are reported along with those content standards (Texas Education Agency, 2010c). Similarly, in the STAAR MASTER™ Student Practice Book, students are asked to demonstrate these important investigation and reasoning skills within the context of practice items for other standards. When one of these skills is incorporated into a practice item, the standard and expectation are identified above the practice item (see Figure 3, below).

Increased Rigor
The STAAR program is described as “significantly more rigorous” (Texas Education Agency, 2010a) than the Texas Assessment of Knowledge and Skills (TAKS). But what does rigor mean in assessment? For the STAAR program, it means the cognitive complexity of items will increase to assess skills at a greater depth. Also, the test will include more griddable items, allowing students to arrive at answers independently through open-ended response. The STAAR MASTER™ Student Practice Book provides items written at varying levels of complexity to accommodate this increase in rigor. (Refer to the “Depth of Knowledge” section on this page and page 5 for more information about the levels of complexity in practice items.)

Alignment
According to the mandate of No Child Left Behind (2001), states are required to develop assessments that tightly align to their content standards. To ensure that this requirement is met, states and districts often conduct alignment studies. In such a study, an assessment is compared to the state’s content standards. If an assessment is rigorous, the study will not yield large disparities between the cognitive demands of the expectations and those of the assessment.

Depth of Knowledge
Norman Webb’s (2002) “depth of knowledge” model is currently one of the most influential alignment models in the field of education. “Depth of knowledge” describes the degree of complexity of knowledge a curricular item requires. Webb identifies four levels of depth of knowledge: recall (Level 1), skill or concept (Level 2), strategic thinking (Level 3), and extended thinking (Level 4). Distinct cognitive demands occur during each activity, or thinking process, level. The items in the STAAR MASTER™ Student Practice Book were aligned to the TEKS using a modified version of the “depth-of-knowledge” model (see “Descriptions of STAAR MASTER™ Complexity Levels,” page 5). During the alignment process, the complexity level of each item (designated “Low,” “Moderate,” or “High”) was determined. The level of each practice item can be found in the Answer Key.

Figure 3: Practice Item Testing Scientific Investigation and Reasoning Skills

5.4A Collect, record, and analyze information using tools to support observations of habitats or organisms.
Descriptions of STAAR MASTER™ Complexity Levels

The following descriptions provide an overview of the three complexity levels used to align the STAAR MASTER™ Student Practice Book items to the eligible Science TEKS. Each explanation details the kinds of thinking required at each level. However, they do not represent all of the possible thought processes for each level.

Low Complexity (L)
Low-complexity items align with the TEKS at Level 1 of the Webb (2002) model. Items of low complexity may involve recalling or recognizing—but not analyzing—basic science concepts. An item may ask students to recognize or use—but not interpret—a well-known formula or simple process for completing a task. Items of this complexity may require identifying the meaning of basic science terminology. At this cognitive level, students may need to locate details in a chart, graph, or diagram. A low-complexity item may ask students to recall, identify, recognize, arrange, locate, measure, use, or define basic information and concepts.

Moderate Complexity (M)
Moderate-complexity items align with the TEKS at Level 2 of the Webb model. Items of moderate complexity involve both comprehension and the subsequent processing of information. Students may be asked to make inferences or identify a cause-and-effect relationship. However, students are not required to go beyond the text to determine an answer. At this cognitive level, students may need to identify similarities and differences. Items may involve determining answers by using information from a chart, graph, or diagram. Items of this complexity may ask students to predict, organize, classify, compare, interpret, distinguish between examples and nonexamples, summarize, identify relationships, select an appropriate process or formula, observe, or collect, organize, and display information.

High Complexity (H)
High-complexity items align with the TEKS at Level 3 and/or Level 4 of the Webb model.* Items of high complexity require students to use strategic, multi-step thinking; develop a deeper understanding of the information; and extend their thinking beyond the page. The items at this level are non-routine and more abstract. Students are asked to demonstrate more flexible thinking, apply prior knowledge, make and test conjectures, and support their responses. High-complexity items may require students to generalize based on patterns. Items may involve interpreting information from a complex graph, table, or diagram. At this cognitive level, students must justify the reasonableness of a solution or an answer when more than one solution or answer exists. Students will use concepts to develop answers and to explain their processes. A high-complexity item may ask students to plan, reason, explain, compare, differentiate, draw conclusions, cite evidence, analyze, synthesize, apply, or prove.

*Note: Although state standards may include expectations that require extended thinking, many large-scale assessment items are not classified at Level 4. Performance and open-ended assessments may require activities at Level 4.
How to Use This Book

Effective Test Preparation
What is the most effective way to prepare students for any science competency test? Experienced educators know that the best test preparation includes three critical components—

• a strong curriculum that is aligned with the content and skills to be assessed
• effective, relevant, and varied instructional methods that allow students to learn content and skills in many different ways
• targeted practice that familiarizes students with the specific content and format of the test

Obviously, a strong curriculum and effective, relevant, and varied instructional methods provide the foundation for all appropriate test preparation. Contrary to what some might believe, merely “teaching the test” performs a great disservice to students. Students must acquire knowledge, practice skills, and have specific educational experiences that can never be included on tests limited by time and in scope. For this reason, resources like the STAAR MASTER® Student Practice Book should never become the heart of the curriculum or replace strong instructional methods.

Targeted Practice
The STAAR MASTER Student Practice Book does, however, address the final element of effective test preparation (targeted test practice). This book familiarizes students with—

• the specific content of Texas’ competency test
• the general format of competency tests

When students become familiar with both the content and the format of a test, they know what to expect on the actual test. This, in turn, improves their chances for success.

Using STAAR MASTER® Products
Used as part of the regular curriculum, the STAAR MASTER Student Practice Book allows teachers to—

• pretest skills students need for the actual test
• determine students’ areas of strength and/or weakness
• provide meaningful test-taking practice for students
• ease students’ test anxiety
• communicate test expectations and content to parents

Much is known about teaching science effectively to learners of all ages.
—John R. Staver

Some Notes on Teaching Science

In 2007, the International Academy of Education published a booklet titled Teaching Science by John R. Staver. The booklet presents several research-based principles for teaching science, as well as practical applications for incorporating these principles into instruction. The eight principles are listed below, but science teachers should read the entire booklet to learn more about each principle and its related practical applications.

Principles for Teaching Science

1. Teaching as a purposeful means to an end
Think of science teaching as a purposeful means to an important end: student learning.

2. Core scientific ideas
Concentrate on the core scientific ideas that have the greatest importance.

3. Deep scientific understanding
Promote deep scientific understanding through teaching that mirrors the nature and characteristics of inquiry in science, the values of science, and the body of scientific knowledge.

4. Complexity of learning
When designing and teaching science lessons, consider the complex interaction between learners’ biological maturation, prior knowledge and experience, and reasoning abilities, so the lessons challenge but do not overwhelm learners’ cognitive capabilities.

5. Active construction of scientific knowledge
Teach with strategies and techniques that help learners become active thinkers.

6. Science content and students’ interests
Connect science content with students’ interests and personal lives, with societal issues, and with other school subjects.

7. Expectations for learning
For all students, set high expectations for learning.

8. Students’ anxieties and conflicts
Use teaching strategies that lessen students’ potential anxieties and perceived conflicts when teaching scientific ideas that may be controversial for learners, even though they are not controversial among scientists.
Answer Key

Note: Complexity levels appear in parentheses. L = Low, M = Moderate, H = High

Reporting Category 1
Exercise 1
1. A (M) 2. D (M) 3. C (M) 4. A (L) 5. C (M)
Exercise 2
1. D (M) 2. A (M) 3. B (M) 4. B (M)
Exercise 3
1. B (H) 2. A (L) 3. C (H)
Exercise 4
1. B (M) 2. B (M) 3. C (M) 4. 50 (M)
Exercise 5
1. C (H) 2. A (M) 3. 205 (L) 4. D (L)

Exercise 4
1. D (L) 2. B (H) 3. B (M) 4. A (H)
Exercise 5
1. C (M) 2. D (H) 3. D (H)
Exercise 6
1. C (H) 2. C (L) 3. A (M)
Exercise 7
1. C (H) 2. C (L) 3. D (H) 4. A (M)
Exercise 8
1. B (H) 2. C (H) 3. D (H) 4. D (H)
Exercise 9
1. B (M) 2. D (M) 3. D (H) 4. C (L)
Exercise 10

STAAR MASTER™ Student Practice Book, Teacher Guide—Science, Grade 5

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STAAR MASTER™ Science References

*All Web sites listed were active at time of publication.


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Force, Motion, and Energy

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Earth and Space

Reporting Category 4 ....................................................................................................59
Organisms and Environments
Use the following information to answer questions 1 and 2.
Kate had a Styrofoam™ cooler, a plastic cooler, and an insulated bag.

She wanted to know which container would keep drinks coolest for the longest period of time. She chilled three identical glasses of water to 40°F. Then, she placed one of the glasses in each container and closed the containers. During the next two hours, she opened each container every 15 minutes and measured the temperature of the water. The results of her experiment appear on the graph below.

5.2C, 5.2D, 5.1G, 5.5A (M)
1. Which of the following could Kate conclude from her results?
   - A. All of the containers had equal insulation.
   - B. The water became warmer in each of the containers.
   - C. The Styrofoam™ cooler kept the water cooler over two hours.
   - D. The insulated bag is the best container for storing cool drinks.

5.2E, 5.5A (M)
2. Which of the following would most improve Kate's experiment?
   - A. Using plastic cups instead of glasses
   - B. Repeating the experiment with other drinks
   - C. Using some containers that have no insulation
   - D. Measuring the water temperature every ten minutes
1. Ms. Morgan’s students wanted to know how fast a toy car could roll down a ramp. The diagram shows how they set up their test. The chart shows the results of their test.

<table>
<thead>
<tr>
<th>Test</th>
<th>Distance (in cm)</th>
<th>Time (in seconds)</th>
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<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Which would be the best way for the students to improve their investigation?

A. Use a longer ramp.
B. Use a different car for their test.
C. Test the car’s speed several times.
D. Increase the friction on the ramp.

2. Look at the wheelbarrow below.

To move the wheelbarrow, you should apply force at Point—

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

3. Mr. Miller set up a demonstration for his students. One step of the demonstration is shown below.

For this demonstration, what was Mr. Miller most likely trying to show his students?

A. The effect of light on how large things appear to be
B. The amount of light needed to see words hidden behind a sign
C. The amount of time it takes for light to travel from one place to another
D. The meaning of the science terms transparent, translucent, and opaque
1. Darlene did research in science class. She made the following chart to record her findings.

<table>
<thead>
<tr>
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<th>Columbus, Ohio</th>
<th>San Antonio, Texas</th>
<th>San Diego, California</th>
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<tr>
<td>Average High Temperature in Summer (in °F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Precipitation in Summer (in inches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average High Temperature in Winter (in °F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Precipitation in Winter (in inches)</td>
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</table>

What was the most likely topic of Darlene’s research?

A. Climates of three cities in the United States
B. Weather forecasts for three cities in the United States
C. Methods for reporting the weather in the United States
D. Movement of weather systems across the United States

2. The Sun’s heat energy causes Earth’s water to change from a liquid to a gas. This process is called—

A. collection
B. condensation
C. evaporation
D. precipitation

3. The rain gauges below show the amounts of precipitation collected during a one-week period of time.

How many total inches of rain fell during the one-week period of time?

Record your answer in the boxes. Then fill in the bubbles. Be sure to use the correct place value.

4. The Moon’s appearance seems to change shape, or go through phases, because—

A. the Moon rotates so quickly on its axis
B. the Moon is seen at different angles from Earth
C. the Moon orbits Earth more slowly than Earth orbits the Sun
D. only the parts of the Moon lit by the Sun are visible from Earth
Reporting Category 4
Living organisms: structures, functions, interdependence

Exercise 1

The following paragraph is about the Texas kangaroo rat. Use information from the paragraph to answer questions 1 and 2.

Texas Kangaroo Rat
The Texas kangaroo rat lives on the Panhandle Plains of Texas. The kangaroo rat burrows at the base of small mesquite bushes to make its home. It eats different kinds of seeds, stems, grasses, and other plants. The kangaroo rat is hunted by foxes and snakes. In recent years, the number of Texas kangaroo rats has decreased, and the animal is now threatened with extinction.

1. Which of the following would most likely reduce the population of Texas kangaroo rats even more?
A. A decrease in the number of prey
B. An increase in the amount of rainfall
C. An increase in the kangaroo rat birthrate
D. Removal of large sections of mesquite brush

2. If the Texas kangaroo rat became extinct, the foxes and snakes in the same ecosystem would most likely—
A. eat seeds and grasses
B. become extinct as well
C. hunt a different animal
D. move to a different place

3. Why is carbon dioxide important for plants?
A. Carbon dioxide gives plants their green color.
B. Plants can release carbon dioxide into the air.
C. Plants use carbon dioxide to make their own food.
D. Carbon dioxide lets plants absorb water through their roots.

4. What element is missing from the food web below?

![Food Web Diagram]

- A. Eagle
- B. Sun
- C. Water
- D. Wolf

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Exercise 15

The paragraph below tells about rabbits in New Zealand. Use information from the paragraph to answer questions 1–3.

**Too Many Rabbits**

Rabbits first arrived in New Zealand in the 1830s. They were taken to New Zealand so that the people there could hunt them. However, by the 1870s, rabbits had taken over parts of New Zealand. There were thousands of rabbits where there had been none. The rabbits ate the grass down to the ground. In some places, the grass never grew back. Today, very few plants grow in those areas.

1. **What is the most likely reason that the rabbit population in New Zealand increased?**
   A. People did not think the rabbits would survive.
   B. The food web did not include animals that ate rabbits.
   C. Other animals did not eat the same food as the rabbits.
   D. Too many people fed the rabbits and took care of them.

2. **What would have been the most likely change caused by the rabbits eating the grass down to the ground?**
   A. Less rain fell in the area.
   B. The weather became colder.
   C. Wind and rain eroded the soil.
   D. More animals lived in the same area.

3. **The rabbits caused a problem in New Zealand because they changed the—**
   A. climate
   B. ecosystem
   C. landforms
   D. weather

4. **Which characteristic would be most helpful for a bird that lives in or near a pond?**
   A. Sharp beak
   B. Sharp claws
   C. Spotted feathers
   D. Webbed feet

5. **A raccoon regularly goes to Tom’s house and eats the food left out for Tom’s cats. The raccoon’s action is an example of a(n)—**
   A. adaptation
   B. inherited trait
   C. learned behavior
   D. natural response