

Science

The grade 4 LEAP 21 Science test is composed of forty multiple-choice items, four independent short-answer items, and one comprehensive science task. The science task consists of three short-answer items and one essay, all based on a manipulated task. A student earns 1 point for each correct answer to a multiple-choice item, from 0 to 2 points for the answer and work shown for each short-answer item, and from 0 to 4 points for the answer and work shown for the essay.

The short-answer items are scored using the following rubric:

Score	Description
2	<ul style="list-style-type: none"> The student's response provides a complete and correct answer.
1	<ul style="list-style-type: none"> The student's response is partially correct. The student's response demonstrates limited awareness or contains errors.
0	<ul style="list-style-type: none"> The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

The essay is scored using the following rubric:

Score	Description
4	<ul style="list-style-type: none"> The student's response demonstrates in-depth understanding of the relevant content and/or procedures. The student completes all important components of the task accurately and communicates ideas effectively. Where appropriate, the student offers insightful interpretations and/or extensions. Where appropriate, the student uses more sophisticated reasoning and/or efficient procedures.
3	<ul style="list-style-type: none"> The student completes most important aspects of the task accurately and communicates clearly. The response demonstrates an understanding of major concepts and/or processes, although less important ideas or details may be overlooked or misunderstood. The student's logic and reasoning may contain minor flaws.
2	<ul style="list-style-type: none"> The student completes some parts of the task successfully. The response demonstrates gaps in conceptual understanding.
1	<ul style="list-style-type: none"> The student completes only a small portion of the task and/or shows minimal understanding of the concepts and/or processes.
0	<ul style="list-style-type: none"> The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

Note: It is important to recognize that the score points for constructed-response items and the LEAP 21 achievement levels do not share a one-to-one correspondence. For example, it should *not* be assumed that a student who scores at the *Advanced* achievement level in the assessment has earned a score of 4 on the essay.

It is possible for a 4th-grade student to earn a total of 58 points on the LEAP 21 Science test. The number of raw score points that a student would have to achieve to reach each achievement level may change slightly from year to year given the difficulty of that particular form of the test. The raw score range for each achievement level is listed below.

Spring 2003 Science Test, Grade 4

Achievement Level	Raw Score Range
Advanced	51–58 points
Mastery	45–50 points
Basic	35–44 points
Approaching Basic	24–34 points
Unsatisfactory	0–23 points

The following section of this document presents four multiple-choice items taken from four strands in the *Teachers' Guide to Statewide Assessment—Science: Physical Science, Science as Inquiry, Science and the Environment, and Earth and Space Science*. In addition, two short-answer items for **Physical Science** and **Life Science** are included, with scoring guides for each item. Student work at each score point (0 to 2 for the short answer) is annotated to explain how the score was derived and the strengths and weaknesses of the response.

The multiple-choice items were selected because they illustrate results from four of the five achievement levels used to report LEAP 21 results—*Approaching Basic, Basic, Mastery* (formerly *Proficient*), and *Advanced*. Examples of *Unsatisfactory* work are not included; by definition, work classified as *Unsatisfactory* exhibits a narrower range of knowledge and skills than the work classified as *Approaching Basic*. Information shown for each item includes

- the correct answer,
- the achievement level or score point,
- the standard and benchmark each item measures, and
- commentary on the skills/knowledge measured by the item.

Note: Test items may have been reduced in size for this document. Font size on the LEAP 21 assessments is typically 12 point.

**Grade 4—Science
Multiple-Choice Items**

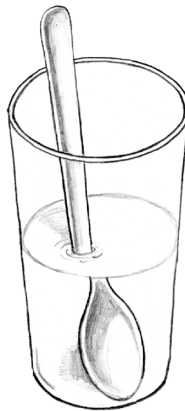
Reporting Category: Physical Science

Benchmark PS-E-C2: Investigating and describing how light travels and what happens when light strikes an object (reflection, refraction, and absorption)

Achievement Level: *Advanced*

Use the picture below to answer question X.

The spoon appears to be broken where it enters the water because



- A. the light is reflected by the water.
- B. the light is absorbed by the water.
- *C. the light is bent by the water.
- D. the light is dissolved by the water.

* correct answer

This Physical Science item would most likely be answered correctly by students who score at the *Advanced* level. To answer the question correctly, students must know how light interacts with different objects or materials and why the spoon appears to be broken where it enters the water. While the water reflects light and this enables one to see the spoon, it is not the cause of the distorted image. The distortion of the spoon's image is caused by the refraction (bending) of light as it moves from the air to the water. Students who score at the *Advanced* level can recognize “how light travels and what happens when light strikes an object (reflection, refraction, and absorption).”

Reporting Category: Science as Inquiry

Benchmark SI-E-B6: Reviewing and asking questions about the results of investigations

Achievement Level: ***Mastery***
(formerly *Proficient*)

Use the information and chart below to answer question X.

The students at Hoover Elementary School did a survey of the eye colors of all the fourth graders at their school. The results are shown in the data chart below.

Hoover Elementary School Fourth-Grade Eye Colors

	Blue	Brown	Green
Ms. Musso's class	9	7	1
Mr. Broussard's class	2	10	4

What does the chart show about Hoover Elementary School?

- A. Brown is the most common eye color in each fourth-grade class.
- B. Green is the least common eye color in both fourth-grade classes.
- * C. Brown is the most common eye color in the fourth grade.
- D. Blue eyes are more common in boys than in girls in the fourth grade.

* correct answer

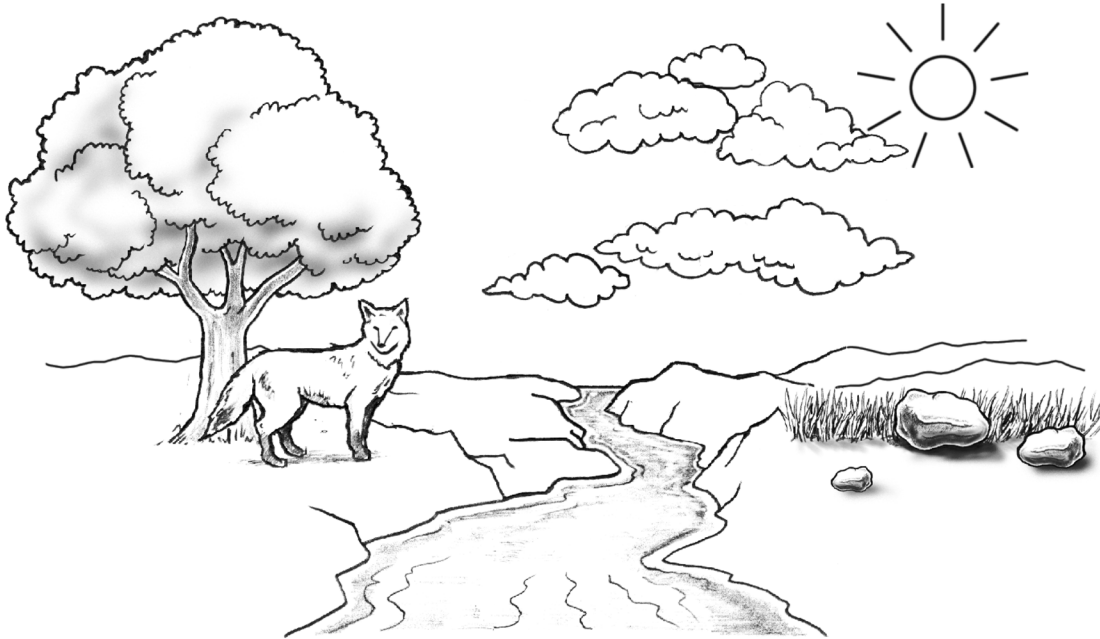
This Science as Inquiry item would most likely be answered correctly by students who score at the *Mastery* level and above. It requires students to review and answer questions about the results of an investigation. To answer the question correctly, students must know how to read a table of information and compare specific quantitative facts to general questions about eye color among the subjects of the investigation. Students must know how to differentiate between questions that are not relevant for the data collected (gender distribution of eye color) from those that are appropriate. To identify the correct answer, the students need to add the numbers in each column to describe the total number of students with each eye color. Students who score at the *Mastery* level can demonstrate an understanding of the results of investigations and what can be learned and answered following their review.

Reporting Category: Science and the Environment

Benchmark SE-E-A1: Understanding that an “ecosystem” is made of living and nonliving components

Achievement Level: *Basic*

Use the picture below to answer question X.



Which of these lists **only** living parts of this ecosystem?

- *A. fox, tree, grass
- B. sun, stream, cloud
- C. cloud, grass, rock
- D. stream, cloud, fox

* correct answer

This Science and the Environment item would most likely be answered correctly by students who score at the *Basic* level and above. It requires students to understand that an ecosystem is made up of living and nonliving components. To answer the question correctly, students must be able to differentiate between living and nonliving things shown in the drawing. Two of the incorrect options include both living and nonliving components. The other incorrect option includes only nonliving components. Students who score at the *Basic* level most likely will recognize the option that includes only living components.

Reporting Category: Earth and Space Science

Benchmark EES-E-A1: Understanding that Earth materials are rocks, minerals, and soils

Achievement Level: ***Approaching Basic***

A rock sample will **most likely** contain

- A. plants.
- *B. minerals.
- C. water.
- D. wood.

* correct answer

This Earth and Space Science item would most likely be answered correctly by students who score at the *Approaching Basic* level and above. A minimal level of knowledge of rocks is needed to answer the item correctly. Students should recognize that rocks are not composed of living material, such as plants or wood. The primary component of most rocks is minerals. Students who score at the *Approaching Basic* level and above can communicate that rocks are composed of various substances, which most likely are minerals.

Grade 4—Science Short-Answer Questions

A science short-answer item for a LEAP 21 test may require students to reflect on an idea, demonstrate their understanding of the unifying concepts and processes of science, make meaning of a given set of data, or critique the design or interpretation of results from an experiment. Frequently, the short-answer items are multipart items; in addition to writing, students are asked to work with graphics, tables, or other materials.

The items, scoring rubrics, and sample student work are shown on the following pages. The student responses at each score point (0 to 2) are annotated to explain how each score was derived and the strengths and weaknesses of the responses.

Sample 1

Reporting Category: Life Science

Benchmark LS-E-A3: Locating and comparing major plant and animal structures and their functions

- a. Draw one flowering plant you would find near your school. Label **one** part of that plant.



- b. What is the function of the part you labeled in your drawing?

Scoring Rubric

Score	Description
2	Student draws a plant and correctly labels one part of the plant (may include root, stem, leaf, or flower) and correctly states the function of the labeled part. Response contains no errors.
1	Student correctly draws and labels a plant OR states the function of a part. Response contains minor errors or omissions.
0	Response is incorrect, irrelevant, too brief to evaluate, or blank

Scoring Information

Root holds the plant in the soil and takes in nutrients.

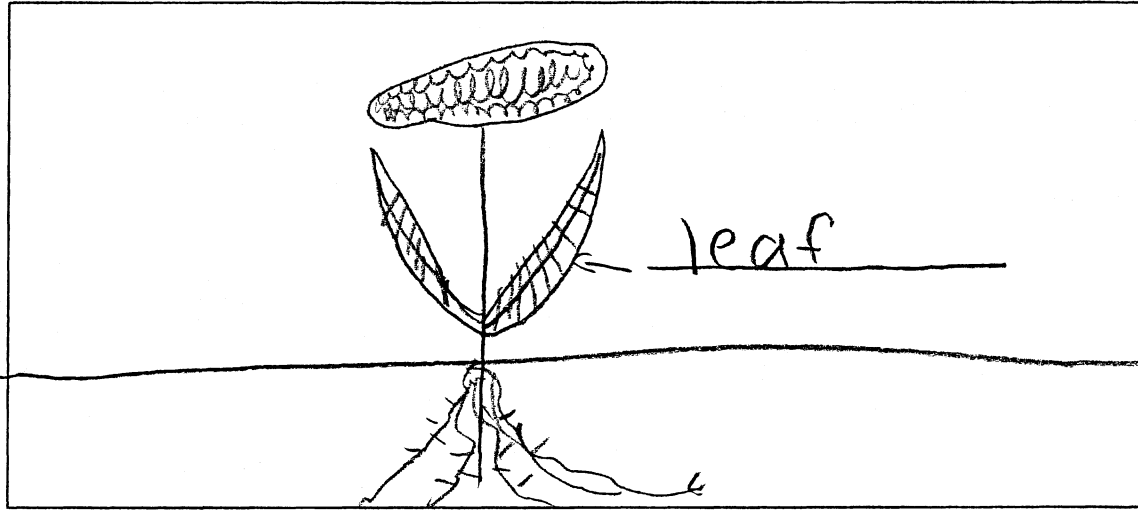
Stem supports the plant and conducts food and water to the leaves.

Leaves produce food (photosynthesis).

Flower produces seeds, attracts insects for pollination.

Score Point 2

a. Draw one flowering plant you would find near your school. Label **one** part of that plant.



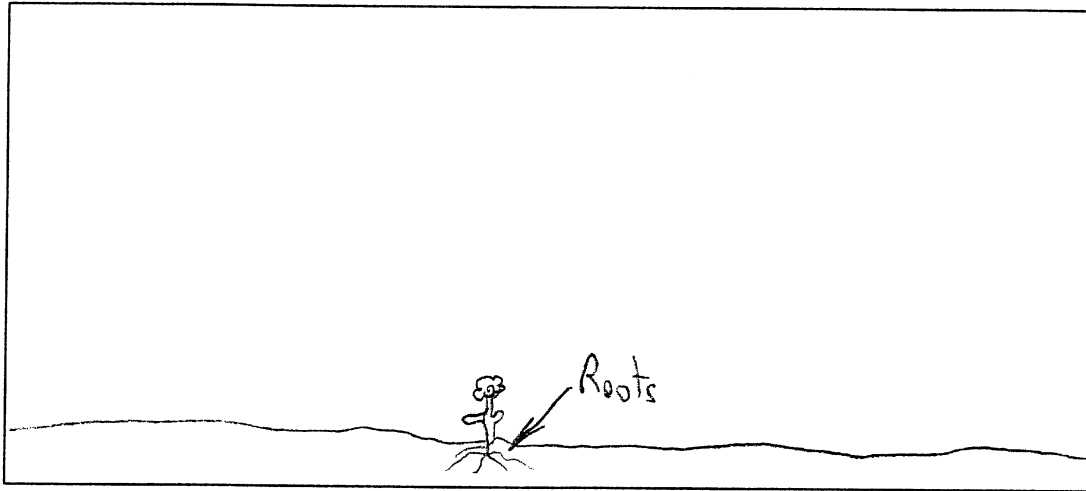
b. What is the function of the part you labeled in your drawing?

The leaf makes the food

The student drew a picture of a plant, labeled a leaf, and correctly stated its function, which is to produce food.

Score Point 1

a. Draw one flowering plant you would find near your school. Label **one** part of that plant.

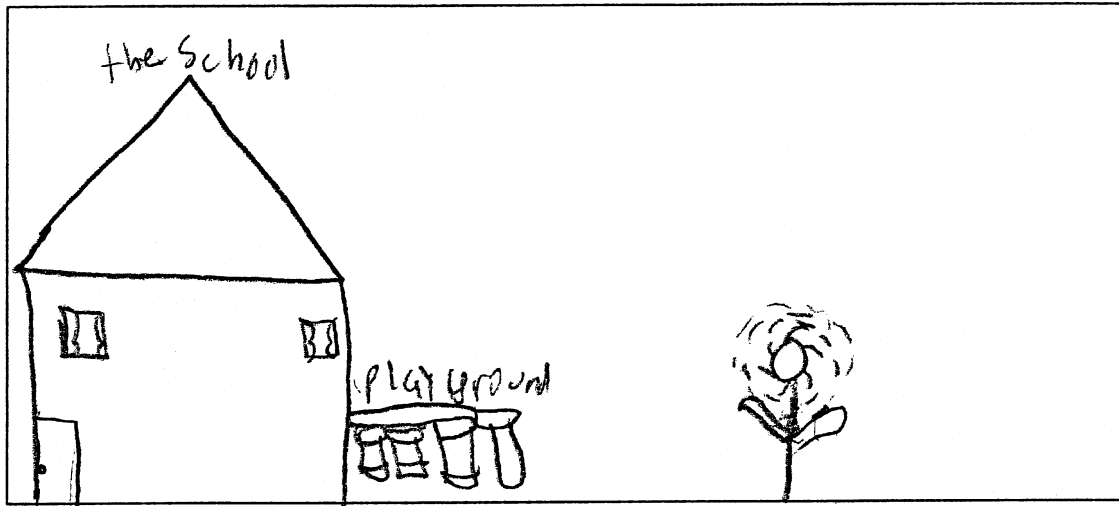


b. What is the function of the part you labeled in your drawing?

The student drew a picture of a plant, labeled the roots, but failed to name the function of the labeled part.

Score Point 0

a. Draw one flowering plant you would find near your school. Label **one** part of that plant.



b. What is the function of the part you labeled in your drawing?

The house school, the playground, in the
flowers that you can make w. seeds.

The student did not draw a complete picture of a plant; the roots are missing. Nor did the student label a part of the plant. Part b does not answer the question.

Sample 2

Reporting Category: Physical Science

Benchmark PS-E-B4: Investigating and describing how the motion of an object is related to the strength of the force (pushing or pulling) and the mass of the object

Use the picture below of Sharon pulling a wagon on a level sidewalk to answer question X.



- a. How would the movement of the wagon be affected if she pulled harder on the wagon?

- b. How would the movement of the wagon be affected if her little brother were sitting in the wagon?

Scoring Rubric

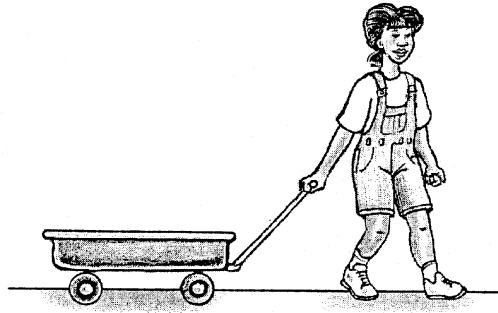
Score	Description
2	The student answers part a and part b without any errors.
1	The student answers part a or part b. Response may contain minor errors or omissions.
0	Response incorrect, irrelevant, too brief to evaluate, or blank.

Scoring Information

- a. The wagon would move faster.
- b. One of the following:
 - The wagon would move slower.
 - It will take more force to move the wagon.
 - It will be harder to move the wagon.

Score Point 2

Use the picture below of Sharon pulling a wagon on a level sidewalk to answer question X.



- a. How would the movement of the wagon be affected if she pulled harder on the wagon?

the wagon will go faster

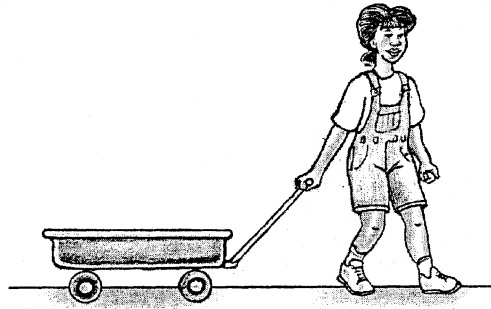
- b. How would the movement of the wagon be affected if her little brother were sitting in the wagon?

the wagon will go slower

The student has two correct key elements. The correct answer for part a is the wagon will move faster when Sharon pulls harder on it. In part b, if weight is added to the wagon, its movement will be slowed.

Score Point 1

Use the picture below of Sharon pulling a wagon on a level sidewalk to answer question X.



- a. How would the movement of the wagon be affected if she pulled harder on the wagon?

it will go faster

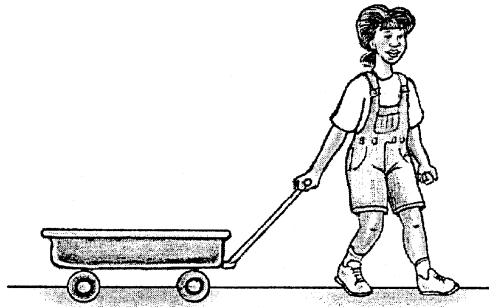
- b. How would the movement of the wagon be affected if her little brother were sitting in the wagon?

he will fall out

The student gets credit for a correct answer in part a but gets no credit for part b, stating that the brother will fall out, since it does not answer how the movement of the wagon is affected.

Score Point 0

Use the picture below of Sharon pulling a wagon on a level sidewalk to answer question X.



a. How would the movement of the wagon be affected if she pulled harder on the wagon?

The wheel could broke the harder she go
and could come off.

b. How would the movement of the wagon be affected if her little brother were sitting in the wagon?

It would broke because its to light for people
to get in and push.

The student does not address the question in either part a or part b. The item asks specifically about the movement of the wagon, not the wheel or the wagon itself.