

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 test has earned a score of 4 on each of the constructed-response items.

It is possible for a 4th grade student to earn a total of 58 points on the LEAP 21 Science test. The number of score points 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 cut scores for each achievement level are listed below.

Spring 2002 Science Test, Grade 4

Achievement Level	Raw Score Range
Advanced	51–58 points
Proficient	46–50 points
Basic	35–45 points
Approaching Basic	26–34 points
Unsatisfactory	0–25 points

The following section of this document presents four multiple-choice items, one taken from each of the four strands in the *Teachers' Guide to Statewide Assessment—Science: Physical Science, Earth and Space Science, Science as Inquiry, and Life Science*. In addition, two short-answer items 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, 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*. The 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.

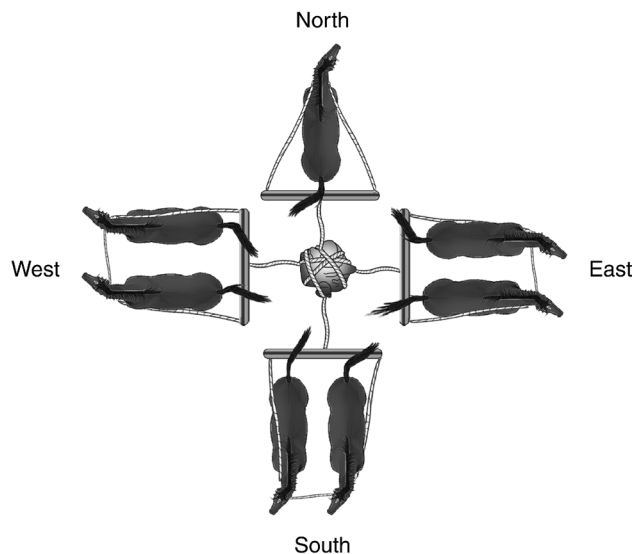
**Grade 4—Science
Multiple-Choice Items**

Reporting Category: Physical Science

Benchmark PS-E-B2: Exploring and recognizing that the position and motion of objects can be changed by pushing or pulling (force) over time

Achievement Level: *Advanced*

If each horse is pulling with the same force, in which direction will the rock move?



- A. north
- B. east
- * C. south
- D. west

* correct answer

This Physical Science item would most likely be answered correctly by students who score at the *Advanced* level. It requires students to use scientific knowledge and to think logically about the problem presented. Students must have a general knowledge of the magnitude and direction of forces to answer the question correctly. Students must be able to determine that the forces acting to the west and east cancel each other because they are equal and opposite. The force to the south is opposite, yet twice that of the force to the north. Consequently, the rock will move in the direction of the greatest resultant force, which is to the south. Students who score at the *Advanced* level can recognize “that the position and motion of an object can be changed by pushing or pulling over time.”

Reporting Category: Earth and Space Science

Benchmark ESS-E-B4: Modeling changes that occur because of the rotation of Earth (alternation of night and day) and the revolution of the Earth around the Sun

Achievement Level: *Proficient*

When you are getting up to go to school in Louisiana, a student on the other side of Earth is getting ready for bed. What is the reason for this?

- A. Earth revolves around the Sun.
- * B. Earth rotates on its axis.
- C. The Sun rotates on its axis.
- D. The Moon revolves around Earth.

* correct answer

This Earth and Space Science item would most likely be answered correctly by students who score at the *Proficient* level and above. It requires students to understand and use scientific knowledge about Earth and Space Science concepts. To answer the question correctly, students must possess a detailed understanding of Earth-Sun-Moon relationships, the difference between rotation and revolution, the effects of each of these bodies' actions on the others, and the differences in time around the globe. Students must know that the motion responsible for day and night on Earth is Earth's rotation on its axis, that it takes approximately 24 hours to complete one rotation (day-night cycle), and that the time difference on the other side of Earth (directly opposite) will be 12 hours. Students who score at the *Proficient* level can demonstrate an understanding of "changes that occur because of the rotation of Earth."

Reporting Category: Science as Inquiry

Benchmark SI-E-A3: Communicating that observations are made with one's senses

Achievement Level: *Basic*

Mrs. Henderson's class has five small, covered boxes. One contains perfume; another contains dried onions. There is also a box of pine needles, a box of lemon pieces, and a box with a paper towel wet with vanilla flavoring. Which should they do to get the **best** information about what is in each box?

- A. Shake the boxes.
- *B. Smell the boxes.
- C. Listen to the boxes.
- D. Weigh the boxes.

* correct answer

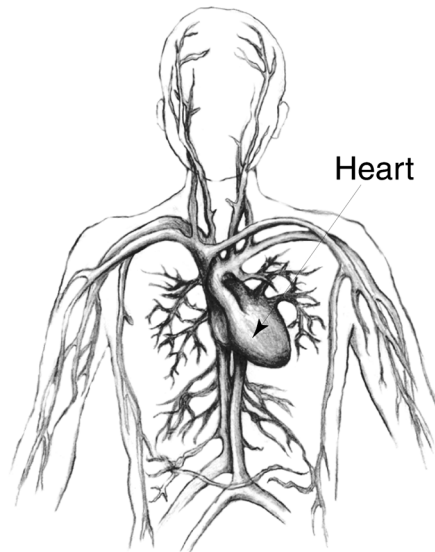
This Science as Inquiry item would most likely be answered correctly by students who score at the *Basic* level and above. It requires students to use scientific knowledge and to think logically about Science as Inquiry. To answer this item correctly, students must have a basic ability to categorize groups of things and to determine which method of collecting information is best for the familiar objects presented in the problem. Students should understand that they should use their sense of smell to gather the best information. (Students should be instructed to use their sense of smell only for identifying or comparing substances when all the substances are known to be safe to smell.) Students who score at the *Basic* level can “use appropriate tools and techniques to gather, analyze, and interpret data” as well as “interpret basic data and communicate the conclusion.”

Reporting Category: Life Science

Benchmark LS-E-A5: Locating major human body organs and describing their functions

Achievement Level: *Approaching Basic*

Use the picture below to answer question X.



What does the heart do for the body?

- A. It takes oxygen in from the environment.
- B. It turns food into energy.
- C. It removes waste from the blood.
- * D. It moves blood through the body.

* correct answer

This Life Science item would most likely be answered correctly by students who score at the *Approaching Basic* level and above. It requires students to use scientific knowledge in Life Science to identify a function of a human organ. A minimal level of knowledge is needed to answer the item correctly. Students should be familiar with the role of the heart from their studies or simply by definition. Students who score at the *Approaching Basic* level and above can “locate major human body organs and describe their functions.”

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-B2: Observing, comparing, and grouping plants and animals according to the likenesses and/or differences

Use the pictures below to answer question X.



bat



bird

Some people think that bats and birds are alike. Other people say they are very different. Look at the two pictures.

a. Tell **one** way bats and birds are the same.

b. Tell **one** way bats and birds are different.

Scoring Rubric

Score	Description
2	The student lists one way birds and bats are similar and one way they are different. There are no errors.
1	The student lists one way birds and bats are similar or one way they are different or gives relevant information in part a and part b that they may contain errors.
0	Response is incorrect or irrelevant to the skill or concept being measured, or blank.

Scoring Information

SIMILARITIES:

Both have wings

Both fly

Both eat insects for food

Both are living things

DIFFERENCES:

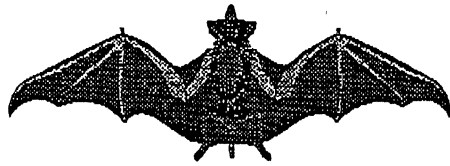
Birds have feathers (bats do not)

Bats use sound for navigation; birds use sight

Bats are mammals; (birds are not)

Implication, shown above in (), is fine and counts for score.

Score Point 2



bat



bird

41. Some people think that bats and birds are alike. Other people say they are very different. Look at the two pictures.

a. Tell one way bats and birds are the same.

A bat and birds are the same because they both have wings.

b. Tell one way bats and birds are different.

Bats and birds are different because a bird was born in a nest and a bat is not.

The student gets a score of 2 points. Part a is correct: both bats and birds have wings. Part b is correct: birds are born in a nest (where the eggs are laid) and bats are not.

Score Point 1



bat



bird

41. Some people think that bats and birds are alike. Other people say they are very different. Look at the two pictures.

a. Tell one way bats and birds are the same.

They fly.

b. Tell one way bats and birds are different.

Bats are scary.
Birds are not

The student gets a score of 1 point for part a: Both the bird and the bat fly. No credit is given for part b.

Score Point 0



bat



bird

38 Some people think that bats and birds are alike. Other people say they are very different. Look at the two pictures.

a. Tell **one** way bats and birds are the same.

They feathers

b. Tell **one** way bats and birds are different.

They different because
They hang by their
feet

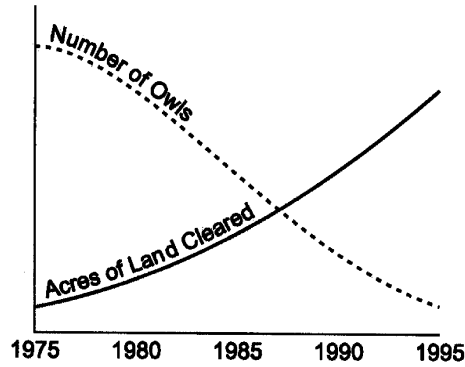
The student gets a score of 0. In part a, the student does not identify which of the animals has feathers; in part b, there is no identification of the animal either.

Sample 2

Reporting Category: Science and the Environment

Benchmark SE-E-A5: Understanding that most plant and animal species are threatened or endangered today due to habitat loss or change

Use the graph below to answer question X, parts a and b.



The graph above shows the owl population in a large forested area over a 20-year period. The graph also shows the acres of forest that were cleared for lumber over the same time period.

a. Why did the owl population change?

b. What could have been done to prevent the change in the owl population?

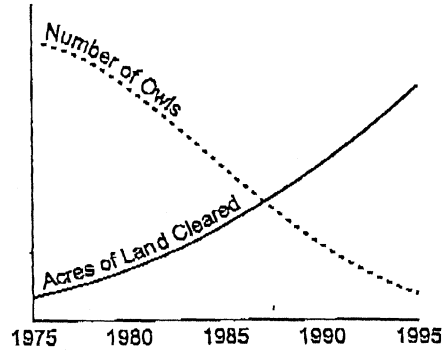
Scoring Rubric

Score	Description
2	The student suggests why the owl population changed and what could be done to prevent the loss of owls. There are no errors.
1	The student answers either part a or part b of the question or the student gives two answers for one part of the question.
0	Response is totally incorrect or irrelevant to the skill or concept being measured, or blank.

Scoring Information:

- a. The owl population changed because of loss of habitat. When the acres of land were cleared for lumber, the owl habitat (food and home) was destroyed because they were clearing the woods.
- b. If all trees had not been cut—or if some land had been left for habitat preservation—the owl population would not have decreased so rapidly. Plant new trees as replacement habitat or cut part of the forest, leaving some for habitat. Run a conservation campaign, put up signs, have a rally, write laws.

Score Point 2



44. The graph above shows the owl population in a large forested area over a 20-year period. The graph also shows the acres of forest that were cleared for lumber over the same time period.

a. Why did the owl population change?

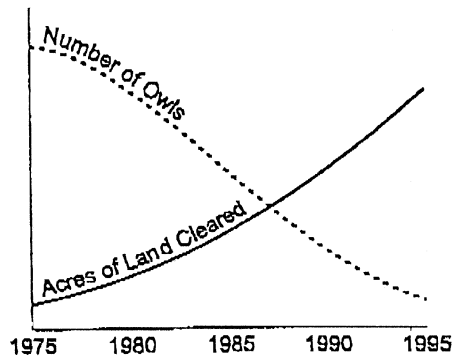
Because when people come and cut down trees and make paper the owl will lost there home and more owls will die.

b. What could have been done to prevent the change in the owl population?

People who liked owls very much. They could of plant more trees every time a tree have been cut down.

The student gets a score of 2 points. Part a is correct. The owl population lost their homes when the trees were cut down. Also some will die for lack of shelter. Part b is a viable solution to the problem: replace the trees that were cut down.

Score Point 1



44. The graph above shows the owl population in a large forested area over a 20-year period. The graph also shows the acres of forest that were cleared for lumber over the same time period.

a. Why did the owl population change?

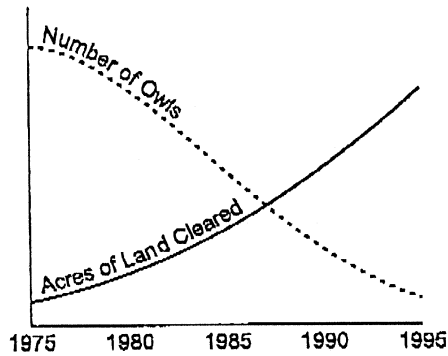
The land started clearing.

b. What could have been done to prevent the change in the owl population?

you could stop clearing land.

The student gets a score of 1 point for part b; a solution to the problem would be to stop the clearing of the land. Part a is not clear enough for credit.

Score Point 0



44. The graph above shows the owl population in a large forested area over a 20-year period. The graph also shows the acres of forest that were cleared for lumber over the same time period.

a. Why did the owl population change?

Acres of land cleared

b. What could have been done to prevent the change in the owl population?

Number of owls

The student gets a score of 0. The student is not answering part a or b. The student is repeating the information on the labels of the graph.