

RELEASED TEST ITEMS

Sample Student Work
Illustrating GEE Achievement Levels

Fall 2009

Science



Grade

11

Louisiana Department of
EDUCATION

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Louisiana’s Graduation Exit Examination (GEE)
GRADE 11 SAMPLE ITEMS AND STUDENT WORK
2008–2009

GEE is an integral part of the Louisiana school and district accountability system passed by the state legislature and signed into law in 1997. The primary purposes of the accountability system are to raise expectations for achievement for all Louisiana public school students and to improve public education in the state.

In April 2009, retesters and grade 11 initial testers took GEE Science and Social Studies tests. The test scores are combined with other relevant data to create school and district accountability scores, which serve as a means of measuring educational quality and improvement in educational programs over time.

GEE Reports

Louisiana’s high school students are tested each year in the spring. Individual student, school, district, and state test results are released in phases in May and July. School and district accountability results are reported in the fall.

For GEE, student scores are reported at five achievement levels: *Advanced*, *Mastery*, *Basic*, *Approaching Basic*, and *Unsatisfactory*. The percentage of students scoring at each level is reported for individual schools, districts, and the state. General definitions for achievement levels are on page 2. Achievement level descriptors for all content areas can be found on the Louisiana Department of Education Web site, www.louisianaschools.net, from the Testing Information link.

GEE

General Achievement Level Definitions

Achievement Level	Definition
Advanced	A student at this level has demonstrated superior performance beyond the level of mastery.
Mastery	A student at this level has demonstrated competency over challenging subject matter and is well prepared for the next level of schooling.
Basic	A student at this level has demonstrated only the fundamental knowledge and skills needed for the next level of schooling.
Approaching Basic	A student at this level has only partially demonstrated the fundamental knowledge and skills needed for the next level of schooling.
Unsatisfactory	A student at this level has not demonstrated the fundamental knowledge and skills needed for the next level of schooling.

Purpose of This Document

This document is part of a series of materials meant to promote understanding of the knowledge and skills students must have and the kinds of work they must produce to be successful on the GEE. Other documents providing background and further information on the GEE tests can be found on the Louisiana Department of Education Web site at www.louisianaschools.net.

NOTE: Teachers are encouraged to use the test items presented in this document as part of a practice test or study guide and doing so is not a violation of test security.

This document presents student work in a Science test, which was completed as part of a GEE assessment. The document includes multiple-choice and short-answer items that exemplify what students scoring at specified achievement levels should know and be able to do. A discussion of each item highlights the knowledge and skills it is intended to measure.

As you review the items, it is important to remember that a student's achievement level is based on his or her total test score (cumulative score for all questions in the test) in a content area, not on one particular item or section, and that the sample items included represent a small portion of the body of knowledge and skills measured by the GEE tests.

Science

The GEE 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 inquiry-based short-answer items and one extended constructed-response item, all based on a given problem or scenario. 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 extended constructed-response item.

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 extended constructed-response item 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 student's 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 student's 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.

It is important to recognize that score points for constructed-response items and GEE 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* level in the assessment has earned a score of 4 on the extended constructed-response item.

It is possible for a high school student to earn a total of 58 points on the GEE Science test. The number of raw 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 spring 2009 raw score range for each achievement level is shown below.

Spring 2009 Science Test, Grade 11

Achievement Level	Raw Score Range
Advanced	50 – 58 points
Mastery	43.5 – 49.5 points
Basic	33 – 43 points
Approaching Basic	24.5 – 32.5 points
Unsatisfactory	0 – 24 points

The following section of this document presents four multiple-choice items, each taken from four of the five science strands: **Physical Science, Life Science, Earth and Space Science,** and **Science as Inquiry.** The items were selected because they illustrate results from four of the five achievement levels used to report GEE results—*Advanced, Mastery, Basic,* and *Approaching Basic.* Examples of *Unsatisfactory* work are not included; by definition, work classified as *Unsatisfactory* exhibits a narrower range of knowledge and skills than work classified as *Approaching Basic.* Information shown for each item includes

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

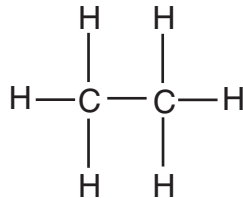
Grade 11—Science Multiple-Choice Items

Strand: Physical Science

Benchmark PS-H-C6: recognizing that carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures

Achievement Level: *Advanced*

Use the diagram below to answer question XX.



How many bonds are made by each carbon atom in the molecule shown above?

- A. one
- B. two
- C. three
- * D. four

* *correct answer*

This item would most likely be answered correctly by students who score at the *Advanced* level. The item requires students to recognize that carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures. Students who choose option A may not recognize the many chemical bonds required to form one molecule of ethane (C_2H_6). Students who choose option B may not recognize that the two carbon atoms in ethane are each bonded to four atoms. Students who choose option C may not recognize that while each carbon atom in ethane is bonded to three hydrogen atoms, each is also bonded to a carbon atom. Students who choose the correct answer, option D, recognize that in a molecule of ethane, each carbon atom has three hydrogen-carbon bonds (H-C) and one carbon-carbon bond (C-C) for a total of four bonds.

Strand: Science as Inquiry

Benchmark SI-H-B1: communicating that scientists usually base their investigations on existing models, explanations, and theories

Achievement Level: *Mastery*

Use the information below to answer question XX.

There are three important parts of cell theory: 1) all living organisms are made of one or more cells, 2) these cells are the basic unit of living things, and 3) all cells are created from preexisting cells. Scientists have also determined that cells create proteins and other organic compounds needed for growth by using information stored in nucleic acids.

Scientists are searching for evidence of life on Mars. Which discovery would be the **best** evidence that life existed on Mars?

- A. complex organic compounds
- B. components of nucleic acids
- C. amino acids and proteins
- * D. fossils of cells

* *correct answer*

This item would most likely be answered correctly by students who score at the *Mastery* level and above. The item requires students to recognize that scientists usually base their investigations on existing models, explanations, and theories, and that scientists use a specific definition (cell theory) to determine whether a substance is living. Students who choose option A, B, or C may not recognize that components of cells (complex organic compounds, components of nucleic acids, amino acids, and proteins) often exist in nonliving substances and are not the best evidence of the existence of life on Mars. Students who choose the correct answer, option D, recognize that cells are the basic building blocks of all living organisms and that the discovery of fossilized cells on Mars would be proof that life once existed there.

Strand: Life Science
Benchmark LS-H-C7: comparing viruses to cells
Achievement Level: *Basic*

A scientist thinks he has discovered a drug that interferes with the functioning of a virus in the human body. To effectively block infection, the drug can

- A. weaken viral respiration.
- B. destroy viral mitochondria.
- C. reduce the ability of the virus to absorb cells.
- * D. prevent the virus from entering cells.

* *correct answer*

This item would most likely be answered correctly by students who score at the *Basic* level and above. The item requires students to know what viruses are and how they function in the human body. Students who choose option A or B may have the misconception that a virus is a living organism with biological processes and morphology similar to simple cells. Viruses are not living organisms, and they do not have cellular organelles such as mitochondria; viruses require a living host for energy (respiration). Students who choose option C may not recognize that viruses attach to and enter cells for access to energy to replicate; they do not absorb cells. Students who choose the correct answer, option D, recognize that a drug that prevents viruses from entering cells would prevent their access to energy and their ability to replicate, thereby effectively blocking infection.

Strand: Earth and Space Science

Benchmark ESS-H-C5: explaining that natural processes and changes in the earth system may take place in a matter of seconds or develop over billions of years

Achievement Level: *Approaching Basic*

The land drained by the Colorado River erodes at a rate of approximately 15 centimeters (cm) in 1,000 years. How long will it take 150 cm of surface material to erode in the Colorado River drainage area?

- A. approximately 15 years
- B. approximately 100 years
- * C. approximately 10,000 years
- D. approximately 30,000 years

* *correct answer*

This item would most likely be answered correctly by students who score at the *Approaching Basic* level and above. The item requires students to recognize that natural processes and changes in Earth's system may take place in a matter of seconds or develop over billions of years and that scientists can use patterns and mathematics to solve problems and make predictions. Students who choose option A, B, or D may not recognize how to use mathematics to analyze the data presented. Students who choose the correct answer, option C, recognize that if it takes 1,000 years to erode 15 cm of surface material, it would take 10 times that number of years to erode 150 cm of surface material ($150 \text{ cm} \div 15 \text{ cm} = 10$ and $10 \times 1,000 \text{ yrs} = 10,000 \text{ yrs}$), or 10,000 years.

Grade 11—Science Short-Answer Item

A science short-answer item for a GEE test may require students to reflect on an idea, demonstrate 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 have more than one part. In addition to writing, students may be asked to work with graphics, tables, or other materials.

The item, scoring rubric, 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 to identify the strengths and weaknesses of the responses.

Strand: Science and the Environment

Benchmark SE-H-A11: understanding how pollutants can affect living systems

Respond to the following.

- A.** Explain how it is possible for a farm in the Midwest to contribute to ocean pollution.

- B.** Explain how a pollutant can affect living things that do not directly contact the original pollutant.

Scoring Rubric

Score	Description
2	The student gives two correct key elements. There are no errors.
1	The student gives one correct key element. There are one or more errors.
0	The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

Scoring Notes

- A.** Chemical fertilizers, herbicides, and pesticides from a farm could enter rivers as runoff or enter the water table through the soil and eventually make their way to the ocean.
- B.** A pesticide can move through food chains through the process of bioaccumulation and thereby affect many living things that do not directly contact the original pollutant.

OR

The pollution of water could affect the soil and kill off crops or other food sources.

OR

Air pollution can cause acid rain that can fall and kill trees or fish many miles away.

Score Point 2

Respond to the following.

- A. Explain how it is possible for a farm in the Midwest to contribute to ocean pollution.

Run off from pesticides goes into a small stream. This stream enters a large river which in turn flows into the ocean, carrying the pesticides.

- B. Explain how a pollutant can affect living things that do not directly contact the original pollutant.

The pollutant can enter an organism's body. When that organism is eaten by a predator, the pollutant enters the predator through the digestive tract.

The student earns 1 point in part A for correctly explaining how pesticides used by a farm could enter runoff and travel to streams and rivers, eventually ending up in the ocean. The student also earns 1 point in part B for correctly explaining how a pollutant can affect an organism that does not come into direct contact with it. The student explains that if an organism contaminated by a pollutant is eaten by a predator, then the predator is also consuming the pollutant even though it never directly encounters the original pollution source.

Score Point 1

Respond to the following.

- A. Explain how it is possible for a farm in the Midwest to contribute to ocean pollution.

The farm could dump excess waste into a river that flows into the ocean.

- B. Explain how a pollutant can affect living things that do not directly contact the original pollutant.

A pollutant can affect that living thing because it will eventually get into that living thing's environment.

The student earns 1 point in part A for correctly explaining how a farm could contribute to ocean pollution. The student describes a scenario of excess waste from the farm (pollutant) being dumped into a river that flows to the ocean. The student receives no points in part B for failing to explain the path from the original pollutant through the environment and ending with the “living thing.”

Score Point 0

Respond to the following.

- A. Explain how it is possible for a farm in the Midwest to contribute to ocean pollution.

It is possible because they can stop the waste
and what-not from their farm getting into the
ocean pollution, such as burning or something.

- B. Explain how a pollutant can affect living things that do not directly contact the original pollutant.

Pollutant can affect living things because the
living things can get whatever is pollutanting the
air and the chain of reaction will go on from
there. Polluting can be hazardous.

The student receives no credit for part A because the student fails to explain the path of the pollution from the farm to the ocean. The student receives no credit for part B because he or she does not explain “the chain of reaction” and how this would allow a pollutant to affect a living thing that did not have direct contact with it.



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