GEE 21

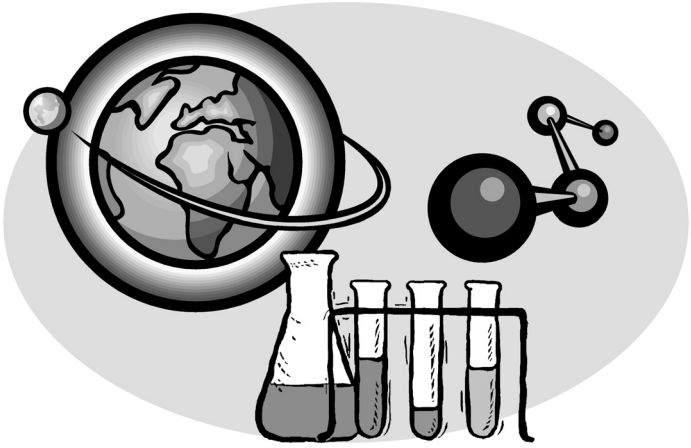
Graduation Exit Examination
for the 21st Century

Released Test Items:

Sample Student Work Illustrating GEE 21
Achievement Levels

July 2004

Grade 11



Science

Reaching For Results
Louisiana Department of EDUCATION

LOUISIANA DEPARTMENT OF EDUCATION

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Louisiana's Graduation Exit Examination for the 21st Century (GEE 21)

GRADE 11 SAMPLE ITEMS AND STUDENT WORK 2003–2004

GEE 21 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 March 2004, retesters and grade 11 initial testers took GEE 21 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.

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 21. A list of other documents providing background and further information on the GEE 21 tests can be found on the Louisiana Department of Education Web site at www.louisianaschools.net.

GEE 21 Reports

Louisiana's high school students are tested each year in March. 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 21, 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 given on page 2. Specific definitions of achievement levels for the Science test were published in the 2002 Released Items document. The achievement level definitions for all content areas can be found on the Louisiana Department of Education Web site at www.louisianaschools.net. Click on the "Testing" link below the tabs at the top of the page, then on the "Achievement Levels" link at the left of the page.

GEE 21
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 presents student work in the Science test, which was completed as part of a GEE 21 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 well as strengths and weaknesses in the student work on the item.

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 in this report represent a small portion of the body of knowledge and skills measured by the GEE 21 tests. Additional items will be released in future years of the GEE 21.

Science

The GEE 21 Science test is made up 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 of which are 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 essay.

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

Score	Description
2	• The student's response provides a complete and correct answer.
1	• The student's response is partially correct. • The student's response demonstrates limited awareness or contains errors.
0	• The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

The essay is scored using the following rubric:

Score	Description
4	• 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	• 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	• The student completes some parts of the task successfully. • The student's response demonstrates gaps in conceptual understanding.
1	• The student completes only a small portion of the task and/or shows minimal understanding of the concepts and/or processes.
0	• The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

Note: It is important to recognize that the score points for the essay and the GEE 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 high school student to earn a total of 58 points on the GEE 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 spring 2004 raw score range for each achievement level is listed on page 4.

Spring 2004 Science Test, Grade 11

Achievement Level	Raw Score Range
Advanced	51.5 – 58 points
Mastery	44 – 51 points
Basic	33.5 – 43.5 points
Approaching Basic	26.5 – 33 points
Unsatisfactory	0 – 26 points

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, Science as Inquiry, Earth and Space Science,** and **Life Science.** In addition, two short-answer items for Life Science and Science and the Environment are included, with scoring guides for each item. Student work at each score point (0 to 2 for the short-answer items) is included. Student responses are 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 GEE 21 results—*Approaching Basic, Basic, Mastery*, and *Advanced*. 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 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: The test items may have been reduced in size for this document. Font size on the GEE 21 assessments is typically 12 point.

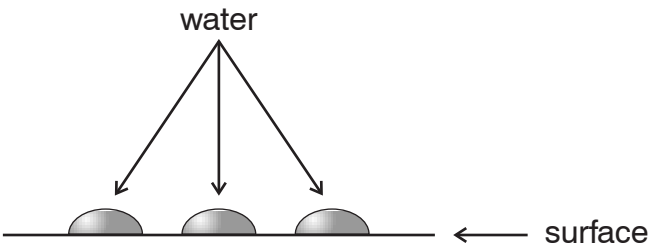
Grade 11—Science
Multiple-Choice Items

Reporting Category: Physical Science

Benchmark PS-H-C3: Understanding that physical properties of substances reflect the nature of interactions among its particles

Achievement Level: ***Advanced***

Use the diagram below to answer question X.



When water falls onto a smooth, nonabsorbent surface, the water forms half–spheres rather than spreading evenly over the surface. This occurs because of strong forces of

* A. electrical attraction between the water molecules.

B. gravitational attraction between the water molecules.

C. nuclear repulsion between the water molecules and the surface molecules.

D. magnetic repulsion between the water molecules and the surface molecules.

* correct answer

This Physical Science item would most likely be answered correctly by students who score at the *Advanced* level. It requires students to apply their understanding of intermolecular forces to a property of water. A force results from the attraction between the partial positive and negative charges of different water molecules. This force is responsible for the formation of beads of water. Students who score at the *Advanced* level understand how intermolecular forces cause water to form beads and recognize that the correct answer accurately describes these intermolecular forces.

Reporting Category: Science as Inquiry

Benchmark SI-H-A5: Recognizing and analyzing alternative explanations and models

Achievement Level: ***Mastery***

Use the information below to answer question X.

Planarian worms swim away from sources of light. One explanation for this behavior is that in the dark their planarian bodies are hidden from predators.

Which statement is another scientifically reasonable explanation for the evolution of this behavior?

A. Light causes planarians' body temperature to decrease.

B. More carbon dioxide for the planarians is found in dark water.

* C. The planarians' food generally is found in dark regions.

D. Light pushes on the planarians and turns them around.

* 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 use science process skills and understanding of the behavior of animals to identify a possible explanation of an example of animal behavior. In this example, light is a stimulus. The response of a planarian worm is to swim away from the light source. One explanation is identified: planarians swim away from light sources to hide from predators. Another possible explanation is that planaria are more likely to find food where it is dark. This explanation is similar to the given explanation because both describe a behavioral response to a stimulus. Students who score at the *Mastery* level and above understand animal behavior and can correctly identify a scientifically reasonable explanation for the behavior.

Reporting Category: Earth and Space Science

Benchmark ESS-H-A2: Modeling the seasonal changes in the relative position and appearance of the Sun and inferring the consequences with respect to Earth's temperature

Achievement Level: ***Basic***

Summer is warmer than other seasons in the Northern Hemisphere because

A. Earth is closer to the Sun.

* B. rays of sunlight are more direct.

C. the Moon blocks fewer of the Sun's warming rays.

D. more wind tends to come from warm areas near the equator.

*correct answer

This Earth and Space Science item would most likely be answered correctly by students who score at the *Basic* Level and above. It requires students to understand the motions of both the Sun and Earth. The combination of Earth's tilted axis and its revolution around the Sun produces Earth's seasons. At different times of year, Earth's tilt and revolution cause areas north and south of the equator to be tilted toward or away from direct sunlight. In the northern hemisphere (about June 21), Earth's northern hemisphere is tilted at the greatest angle toward the Sun. Warmer weather is a result of longer days and sunlight striking this part of Earth at a more direct angle. A major misconception of many students is that summer is a warmer season as a result of Earth being closer to the Sun. The distance between Earth and the Sun is not the cause of different seasons on Earth. Students who score at the *Basic* level and above understand that summer is the warmest season because the Sun's rays are more direct during this time. The student understands this is a result of the Earth tilting on its axis and its relative position as it revolves around the Sun.

Reporting Category: Life Science

Benchmark LS-H-D2: Describing trophic levels and energy flows

Achievement Level: ***Approaching Basic***

Which food chain correctly summarizes the flow of energy through an ecosystem?

A. sun → rabbit → grass → fox
B. rabbit → fox → sun → grass
C. fox → sun → rabbit → grass
* D. sun → grass →rabbit → fox

*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 recognize the interrelationship among plants and animals as energy moves from one organism to the next in a food chain. Students should understand that there are producers and consumers in a food chain. Since food chains often begin with the Sun, producers (organisms that use the Sun's energy to make food) always form the next step in a food chain. Plants with chlorophyll capture the energy from the Sun and make food, which transfers energy to the consumers of these plants. The energy can move through different levels of consumers. Two of the incorrect options in this item begin with a consumer (rabbit or fox). The other incorrect option begins with the Sun and suggests that the rabbit absorbs energy directly from the Sun rather than the energy being converted to a usable food source by plants. Students who score at the *Approaching Basic* level and above will most likely recognize the option that correctly summarizes the flow of energy: from the Sun to producer to primary consumer to secondary consumer.

Grade 11—Science
Short-Answer Items

A science short-answer item for a GEE 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. 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-H-B1: Explaining the relationship among chromosomes, DNA, genes, RNA, and proteins

Suppose a change occurs in one of the molecules making up the DNA in the nucleus of a cell.

A. Explain why this change could affect a protein that is made in the cytoplasm.

_____

_____

_____

_____

B. Explain **one** role RNA plays in making the protein.

_____

_____

_____

Scoring Rubric

Score	Description
2	The student's response completely answers part a and part b. Response contains no errors.
1	The student's response answers part a **OR** answers part b. Response contains errors or omissions.
0	The student's response is totally incorrect, irrelevant, too brief to evaluate, or blank.

Training Notes

Basically assign one point for each part.

a. DNA contains the code for making the protein (or for sequencing the amino acids). If the DNA changes, the new coding could be for a different protein (or sequence of amino acids).

b. Possible answers for part b include:

- The DNA code gets out of the nucleus and affects the construction of the protein in the cytoplasm by being transferred to RNA, which actually constructs the protein, **OR**
- RNA is used to pick up amino acids and bring them to where the protein is being made (i.e., the ribosome), **OR**
- RNA makes sure the building blocks of proteins (i.e., amino acids) are put in the correct order in the protein.

Score Point 2

Suppose a change occurs in one of the molecules making up the DNA in the nucleus of a cell.

A. Explain why this change could affect a protein that is made in the cytoplasm.

This change could affect a protein that is made in the cytoplasm because the makeup of the protein would also have to change.

B. Explain **one** role RNA plays in making the protein.

RNA determines the composition of the protein.

The student earns 2 points for correctly explaining that the new coding could be for a different protein (part A) and for stating that the RNA is responsible for constructing the protein (part B).

Score Point 1

Suppose a change occurs in one of the molecules making up the DNA in the nucleus of a cell.

A. Explain why this change could affect a protein that is made in the cytoplasm.

If a change occurs in one of the molecules making up the DNA in the nucleus of a cell, then the protein will change because the molecules are not the same.

B. Explain **one** role RNA plays in making the protein.

RNA gives off substances that are needed in making protein.

The student earns 1 point for part A. The protein will be different because the molecules changed. The student's response to part B did not receive credit because the role of the RNA is not correct.

Score Point 0

Suppose a change occurs in one of the molecules making up the DNA in the nucleus of a cell.

A. Explain why this change could affect a protein that is made in the cytoplasm.

A protein my be affected, because the molecules are needed to make the cytoplasm.

B. Explain **one** role RNA plays in making the protein.

RNA plays the role of a photosynthesis in the protein.

The student does not get credit for these answers; both are incorrect.

Sample 2

Reporting Category: Science and the Environment

Benchmark SE-H-A6: Describing and explaining Earth's biochemical and geochemical cycles and their relationship to ecosystem stability

Describe the role **two** organisms play in the nitrogen cycle.

_____

_____

_____

_____

Scoring Rubric

Score	Description
2	The student's response describes the role two organisms play in the nitrogen cycle. Response contains no errors.
1	The student's response describes the role one organism plays in the nitrogen cycle. Response contains errors or omissions.
0	The student's response is totally incorrect, irrelevant, too brief to evaluate, or blank.

Training Notes

Possible Answers

- [nitrogen-fixing] bacteria—convert atmospheric nitrogen to ammonium
- [root-nodule] bacteria—convert atmospheric nitrogen to usable products for plants
- consumers (animals)—eat plant or animal material and produce nitrogenous wastes
- bacteria or fungi—decompose plant and animal nitrogen compounds to produce ammonium
- [nitrifying soil] bacteria—convert ammonium to nitrites and nitrates
- plants—assimilate nitrates into plant material
- [denitrifying] bacteria—convert nitrates to nitrogen

Note: A response using bacteria twice should receive full credit if two different roles are described.

Score Point 2

Describe the role **two** organisms play in the nitrogen cycle.

Nitrogen fixing bacteria allow nitrogen to be absorbed by plants. Plants give nitrogen to those organism that eat them

The student earns 2 points for the correct description of the role two organisms play in the nitrogen cycle. Bacteria converts nitrogen to usable products for plants, and plants assimilate nitrates into plant material that is consumed by plant eaters.

Score Point 1

Describe the role **two** organisms play in the nitrogen cycle.

One organism lives its life then later dies, leaving behind its remains it decays, realeasing nitrogen, which benefits other animals.

The student scores 1 point for describing the role one organism plays in the nitrogen cycle. Consumers produce nitrogenous wastes.

Score Point 0

Describe the role **two** organisms play in the nitrogen cycle.

The cold cell play in the nitrogen cycle it by forming new cells.

The student does not get credit for an irrelevant response.

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