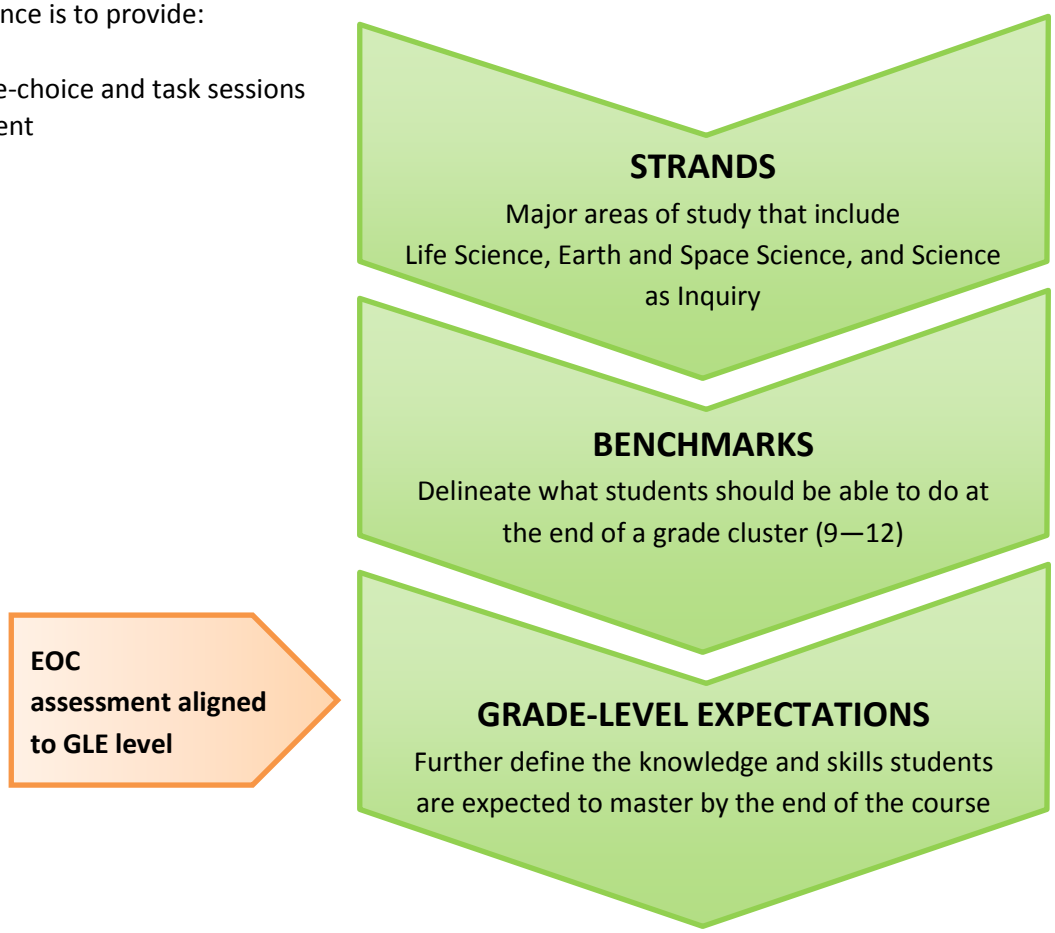
The Biology End-of-Course test (EOC) continues to assess Biology grade-level expectations (GLEs). The design of the test remains the same as in previous administrations.

The purpose of this assessment guidance is to provide:

- the structure of the test
- specifications for the multiple-choice and task sessions
- the GLEs eligible for assessment
- links to sample test items



Strands, Benchmarks, and Grade-Level Expectations (GLEs)

Louisiana's science content standards—broad statements of expectations for student learning— encompass five strands: Science as Inquiry, Physical Science, Life Science, Earth and Space Science, and Science and the Environment. The Biology test assesses three strands of the five strands: Life Science, Earth and Space Science, and Science as Inquiry primarily through life science concepts. More emphasis is placed on the categories in Life Science: the cell, the molecular basis of heredity, biological evolution, interdependence of organisms, matter, energy, and organization of living systems, systems and the behavior of organisms, and personal and community health.

To delineate what students should know and be able to do, each standard is divided into benchmarks for grade clusters (5-8 or 9-12). Benchmarks are organized into three or four thematic categories within each strand. These categories provide content definition by highlighting the underlying themes within the domain of each strand.

To further define the knowledge and skills students are expected to know at the end of each grade, not just at the end of a grade span, Louisiana educators developed grade-level expectations (GLEs).

GLEs Eligible for Assessment

While all Biology GLEs are eligible for assessment, some strands and components receive more emphasis. The components of Life Science are assessed through multiple-choice items and the task. The Earth and Space Science strand and the Science as Inquiry strand are assessed through multiple-choice items only. Some, however, do not lend themselves to direct assessment in multiple-choice format. The following GLEs are not assessed:

- Science as Inquiry: 2,6,12

Test Structure

Test Sessions	Number of Items	Number of Points	Suggested Testing Time**
Session 1: Multiple Choice	25*	23	40 minutes
Session 2: Task	4 multiple choice 2 extended response*	6 (2 multiple choice = 1 pt each, 1 extended response = 4 pts)	50 minutes
Session 3: Multiple Choice	25*	23	40 minutes

*Contains embedded field test items which are used to develop new test forms.

The EOC test is **untimed.

Test Specifications

Number and Percentage of Points by Strand for the Multiple-Choice Session*

Strand or Component	**Approximate Percentage by Component**	**Approximate Percentage by Strand**
Life Science		71
1. The Cell	11	
2. The Molecular Basis of Heredity	11	
3. Biological Evolution	11	
4. Interdependence of Organisms	8	
5. Matter, Energy, and Organization of Living Systems	8	
6. Systems and the Behavior of Organisms	11	
7. Personal and Community Health	10	
Earth and Space Science		12
Science as Inquiry		17
Total		100

*The table refers to the multiple-choice session only.

Specifications for the Task

The task promotes science literacy through the use of discipline-specific practices to collect, apply, and communicate content knowledge. The task reflects the rigor of Louisiana's content standards and applies English language arts standards for reading informational text (includes science and technical texts) and writing to a science context.

The items in the task are aligned to science GLEs. The task may assess the following science strand: Life Science.

The task consists of two multiple-choice items and one extended-response item. The items are based on one or two stimulus materials. The extended-response portion of the task requires students to provide a written response that will be scored using a 0-4 point rubric. The task asks students to incorporate science content knowledge with evidence from stimulus materials. A sample task for Biology may be found in the Sample Items document.

For the Biology test, the literacy skills required by the task may include some or all of the following:

- citing specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
- determining the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text
- following precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases of exceptions defined in the text
- determining the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context relevant to grade 10 texts and topics
- analyzing the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy)
- analyzing the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address
- translating quantitative or technical information expressed in words in a text into visual form (e.g., table or chart) and translating information expressed visually or mathematically (e.g., in an equation) into words
- assessing the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem
- comparing and contrasting findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts

Description of Stimulus Material

The multiple-choice and task sessions of the Biology EOC test may incorporate the following types of stimulus material:

- an excerpt from a text-based source
- data tables or graphs presenting data to be read or interpreted
- charts, illustrations, or graphic organizers
- descriptions and details of science investigations
- maps showing geographical features

Examples of the types of stimulus materials may be found in the Sample Items document.

BIOLOGY LIFE SCIENCE	
BENCHMARKS – THE CELL	**GRADE-LEVEL EXPECTATIONS**
LS-H-A1: observing cells, identifying organelles, relating structure to function, and differentiating among cell types **LS-H-A2**: demonstrating a knowledge of cellular transport **LS-H-A3**: investigating cell differentiation and describing stages of embryological development in representative organisms	1. Compare prokaryotic and eukaryotic cells 2. Identify and describe structural and functional differences among organelles 3. Investigate and describe the role of enzymes in the function of the cell 4. Compare active and passive cellular transport 5. Analyze the movement of water across a cell membrane in hypotonic, isotonic, and hypertonic solutions 6. Analyze a diagram of a developing zygote to determine when cell differentiation occurs
BENCHMARKS – THE MOLECULAR BASIS OF HEREDITY	**GRADE-LEVEL EXPECTATIONS**
LS-H-B1: explaining the relationship among chromosomes, DNA, genes, RNA, and proteins **LS-H-B2**: comparing and contrasting mitosis and meiosis **LS-H-B3**: describing the transmission of traits from parent to offspring and the influence of environmental factors on gene expression **LS-H-B4**: exploring advances in biotechnology and identifying possible positive and negative effects	7. Identify the basic structure and function of nucleic acids (e.g., DNA, RNA) 8. Describe the relationship among DNA, genes, chromosomes and proteins 9. Compare mitosis and meiosis 10. Analyze pedigrees to identify patterns of inheritance for common genetic disorders 11. Calculate the probability of genotypes and phenotypes of offspring given the parental genotype 12. Describe the processes used in modern biotechnology related to genetic engineering 13. Identify possible positive and negative effects of advances in biotechnology
BENCHMARKS – BIOLOGICAL EVOLUTION	**GRADE-LEVEL EXPECTATIONS**
LS-H-C1: exploring experimental evidence that supports the theory of the origin of life **LS-H-C2**: recognizing the evidence for evolution **LS-H-C3**: discussing the patterns, mechanisms, and rate of evolution **LS-H-C4**: classifying organisms	14. Analyze evidence on biological evolution, utilizing descriptions of existing investigations, computer models, and fossil records 15. Compare the embryological development of animals in different phyla 16. Explain how DNA evidence and fossil records support Darwin's theory of evolution

LS-H-C5: distinguishing among the kingdoms **LS-H-C6**: comparing and contrasting life cycles of organisms **LS-H-C7**: comparing viruses to cells	17. Explain how factors affect gene frequency in a population over time 18. Classify organisms from different kingdoms at several taxonomic levels, using a dichotomous key 19. Compare characteristics of the major kingdoms 20. Analyze differences in life cycles of selected organisms in each of the kingdoms 21. Compare the structures, functions, and cycles of viruses to those of cells 22. Describe the role of viruses in causing diseases and conditions (e.g., AIDS, common colds, smallpox, influenza, warts)
BENCHMARKS – INTERDEPENDENCE OF ORGANISMS	**GRADE-LEVEL EXPECTATIONS**
LS-H-D1: illustrating the biogeochemical cycles and explaining their importance **LS-H-D2**: describing trophic levels and energy flows **LS-H-D3**: investigating population dynamics **LS-H-D4**: exploring how humans have impacted ecosystems and the need for societies to plan for the future	23. Illustrate the flow of carbon, nitrogen, and water through an ecosystem 24. Analyze food webs by predicting the impact of the loss or gain of an organism 25. Evaluate the efficiency of the flow of energy and matter through a food chain/pyramid 26. Analyze the dynamics of a population with and without limiting factors 27. Analyze positive and negative effects of human actions on ecosystems
BENCHMARKS – MATTER, ENERGY, AND ORGANIZATION OF LIVING SYSTEMS	**GRADE-LEVEL EXPECTATIONS**
LS-H-E1: comparing and contrasting photosynthesis and cellular respiration; emphasizing their relationships **LS-H-E2**: recognizing the importance of the ATP cycle in energy usage within the cell **LS-H-E3**: differentiating among levels of biological organization	28. Explain why ecosystems require a continuous input of energy from the Sun 29. Use balanced equations to analyze the relationship between photosynthesis and cellular respiration 30. Explain the role of adenosine triphosphate (ATP) in a cell 31. Compare the levels of organization in the biosphere
BENCHMARKS – SYSTEMS AND THE BEHAVIOR OF ORGANISMS	**GRADE-LEVEL EXPECTATIONS**
LS-H-F1: identifying the structure and functions of organ systems **LS-H-F2:** identifying mechanisms involved in homeostasis **LS-H-F3:** recognizing that behavior is the response of an organism to internal changes and/or external stimuli **LS-H-F4:** recognizing that behavior patterns have adaptive value	32. Analyze the interrelationship of organs in major system 33. Compare structure to function of organs in a variety of organisms 34. Explain how body systems maintain homeostasis 35. Explain how selected organisms respond to a variety of stimuli 36. Explain how behavior affects the survival of species

BENCHMARKS – PERSONAL AND COMMUNITY HEALTH	GRADE-LEVEL EXPECTATIONS
LS-H-G1: relating fitness and health to longevity **LS-H-G2:** contrasting how organisms cause disease **LS-H-G3:** explaining the role of the immune system in fighting disease **LS-H-G4:** exploring current research on the major diseases with regard to cause, symptoms, treatment, prevention, and cure **LS-H-G5:** researching technology used in prevention, diagnosis, and treatment of disease/disorders	37. Explain how fitness and health maintenance can result in a longer human life span 38. Discuss mechanisms of disease transmission and processes of infection 39. Compare the functions of the basic components of the human immune system 40. Determine the relationship between vaccination and immunity 41. Describe causes, symptoms, treatments, and preventions of major communicable and noncommunicable diseases 42. Summarize the uses of selected technological developments related to the prevention, diagnosis, and treatment of diseases or disorders
EARTH AND SPACE SCIENCE	
BENCHMARKS – ENERGY IN EARTH'S SYSTEM	**GRADE-LEVEL EXPECTATIONS**
ESS-H-A1: investigating the methods of energy transfer and identifying the sun as the major source of energy for most of the earth's systems	1. Describe what happens to the solar energy received by earth everyday 2. Trace the flow of heat energy through the processes in the water cycle 3. Describe the effect of natural insulation on energy transfer in a closed system
BENCHMARKS – GEOCHEMICAL CYCLES	**GRADE-LEVEL EXPECTATIONS**
ESS-H-B1: illustrating how stable chemical atoms or elements are recycled through the solid earth, oceans, atmosphere, and organisms **ESS-H-B2:** demonstrating earth's internal and external energy sources as forces in moving chemical atoms or elements	13. Explain how stable elements and atoms are recycled during natural geologic process 15. Identify the sun-driven processes that move substances at or near earth's surface
BENCHMARKS – THE ORIGIN AND EVOLUTION OF THE EARTH SYSTEM	**GRADE-LEVEL EXPECTATIONS**
ESS-H-C2: estimating the age of the earth by using dating techniques **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	17. Determine the relative ages of rock layers in a geologic profile or cross section 18. Use data from radioactive dating techniques to estimate the age of earth materials 22. Analyze data related to a variety of natural processes to determine the time frame of the changes involved (e.g., formation of sedimentary rock layers, deposition of ash layers, fossilization of plant or animal species)

SCIENCE AS INQUIRY	
BENCHMARKS – THE ABILITIES NECESSARY TO DO SCIENTIFIC INQUIRY	**GRADE-LEVEL EXPECTATIONS**
SI-H-A1: identifying questions and concepts that guide scientific investigations **SI-H-A2:** designing and conducting scientific investigations **SI-H-A3:** using technology and mathematics to improve investigations and communications **SI-H-A4:** formulating and revising scientific explanations and models using logic and evidence **SI-H-A5:** recognizing and analyzing alternative explanations and models **SI-H-A6:** communicating and defending a scientific argument **SI-H-A7:** utilizing science safety procedures during scientific investigations	1. Write a testable question or hypothesis when given a topic 3. Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls. 4. Conduct an investigation that includes multiple trials and record, organize, and display data properly 5. Utilize mathematics, organizational tools, and graphing skills to solve problems 7. Choose appropriate models to explain scientific knowledge or experimental results (e.g., objects, mathematical relationships, plans, schemes, examples, role-playing, computer simulations) 8. Give an example of how new scientific data can cause an existing scientific explanation to be supported, revised, or rejected 9. Write and defend a conclusion based on logical analysis of experimental data 10. Given a description of an experiment, identify appropriate safety measures
BENCHMARKS – UNDERSTANDING SCIENTIFIC INQUIRY	**GRADE-LEVEL EXPECTATIONS**
SI-H-B1:communicating that scientists usually base their investigations on existing models, explanations, and theories **SI-H-B2:** communicating that scientists conduct investigations for a variety of reasons, such as exploration of new areas, discovery of new aspects of the natural world, confirmation of prior investigations, evaluation of current theories, and comparison of models and theories **SI-H-B3:** communicating that scientists rely on technology to enhance the gathering and manipulation of data **SI-H-B4:** analyzing a proposed explanation of scientific evidence according to the following criteria: follow a logical structure, follow rules of evidence, allow for questions and modifications, and is based on historical and current scientific knowledge **SI-H-B5:** communicating that the results of scientific inquiry, new knowledge,	11. Evaluate selected theories based on supporting scientific evidence 13. Identify scientific evidence that has caused modifications in previously accepted theories 14. Cite examples of scientific advances and emerging technologies and how they affect society (e.g., MRI, DNA in forensics) 15. Analyze the conclusion from an investigation by using data to determine its validity 16. Use the following rules of evidence to examine experimental results: a. Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability? b. Has the technique or theory been subjected to peer review and publication?

and methods emerge from different types of investigations and public communication among scientists	c. What is the known or potential rate of error of the technique or theory when applied? d. Were standards and controls applied and maintained? e. Has the technique or theory been generally accepted in the scientific community?

Explanation of Codes:

GLEs are numbered consecutively in each grade level and grouped by strand and thematic category. Benchmarks are coded by strand, grade cluster, and benchmark number. The first term in the code refers to the strand. The second term refers to the grade cluster, and the third term refers to the category and benchmark number.

Examples of Science Codes:

CODE	TRANSLATION
SI-E-A5	SI Strand, Elementary, Category A, Benchmark 5
PS-M-B4	PS Strand, Middle School, Category B, Benchmark 4
SE-H-A6	SE Strand, High School, Category A, Benchmark 6