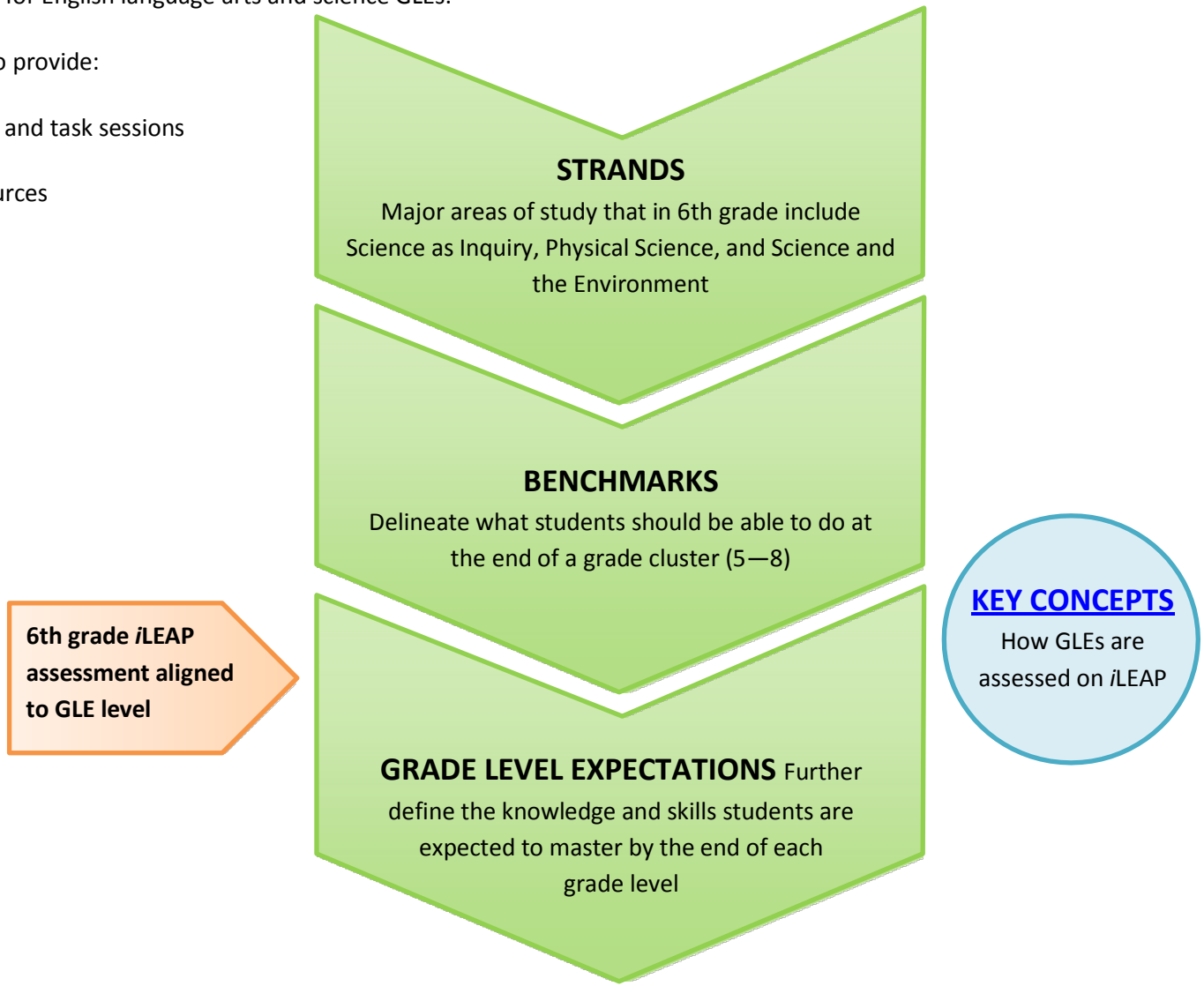
Grade 6 Science Assessment Structure

In 2013-2014, the grade 6 *i*LEAP test continues to assess Louisiana's science grade-level expectations GLEs. The design of the multiple-choice session of the test remains the same as it was in 2012-2013 and previous administrations. In contrast to the 2012-2013 test, however, this year the *i*LEAP contains a new task aligned to the Common Core State Standards for English language arts and science GLEs.

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 items and other resources



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 grade 6 assess three of the five strands: Science as Inquiry, Physical Science, and Science and the Environment. At grade 6, the focus for students is physical science concepts. The content includes the nature of matter, elements, simple chemical reactions, the effects of forces on the motion of objects, forms of energy, and characteristics and outcomes of energy transformations

To delineate what students should know and be able to do, each strand is divided into benchmarks for grade clusters (K-4 or 5-8). Benchmarks are organized into two to four thematic categories within each strand. These categories (e.g., Abilities Necessary to Do Scientific Inquiry, or Transformations of Energy) 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)

Test Structure

Test Sessions	Number of Items	Number of Points	Suggested Testing Time*
Multiple Choice	48	48	60 minutes
Task	4 multiple choice 1 extended response	8 (multiple choice = 1 pt each, extended response = 4 pts)	30 minutes

*The science test is **untimed.**

Specifications for the Multiple-Choice Session

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

Strand/Category	**% of Points**
Science as Inquiry	42
A. The Abilities Necessary to Do Scientific Inquiry	
B. Understanding Scientific Inquiry	
Physical Science	42
A. Properties and Changes of Properties in Matter	
B. Motion and Forces	
C. Transformations of Energy	
Science and the Environment	16
Total	100

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

Most of the GLEs are eligible for assessment on the multiple-choice session of the *i*LEAP science test. Some, however, do not lend themselves to direct assessment in a multiple-choice format. The following GLEs are not assessed:

Science as Inquiry: 7,8,9,14,15,19,20,24,37,40

Physical Science: 1,3,6,7,20,31

Description of the Task

The Common Core State Standards (CCSS) present a new paradigm for how literacy should be integrated into science instruction. The task reflects the rigor of Common Core and applies English language arts standards for reading informational text (including science and technical texts) and writing to a science context.

The items in the task are aligned to both science GLEs and the CCSS for ELA. The task may assess any of the three science strands: Science as Inquiry, Physical Science, and Science and the Environment. The following GLEs are not assessed in the task session:

Science as Inquiry: 8,24

Physical Science: 1,7

The task consists of four 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 grade 6 may be found in the Sample Items document.

At grade 6, the literacy skills required by the task may include some or all of the following:

- citing specific textual evidence
- determining the central ideas or conclusions of a text
- following precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks
- determining the meaning of symbols, key terms, and other domain-specific words and phrases
- analyzing the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text
- integrating quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, table)
- distinguishing among facts, reasoned judgment based on research findings, and speculation in a text
- comparing and contrasting the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic

Description of Stimulus Material

The multiple-choice and task sessions of the grade 6 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.

GRADE 6 SCIENCE STANDARDS, BENCHMARKS, AND GLE'S	
Science as Inquiry: **Students will *do* science by engaging in partial and full inquiries that are within their developmental capabilities.**	
A. The Abilities Necessary to Do Scientific Inquiry	
BENCHMARKS	**GRADE-LEVEL EXPECTATIONS**
SI-M-A1: identifying questions that can be used to design a scientific investigation	1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation 2. Identify problems, factors, and questions that must be considered in a scientific investigation 3. Use a variety of sources to answer questions
SI-M-A2: designing and conducting a scientific investigation	4. Design, predict outcomes, and conduct experiments to answer guiding questions 5. Identify independent variables, dependent variables, and variables that should be controlled in designing an experiment
SI-M-A3: using mathematics and appropriate tools and techniques to gather, analyze, and interpret data	6. Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations 7. Record observations using methods that complement investigations (e.g., journals, tables, charts) 8. Use consistency and precision in data collection, analysis, and reporting 9. Use computers and/or calculators to analyze and interpret quantitative data
SI-M-A4: developing descriptions, explanations, and graphs using data	10. Identify the difference between description and explanation 11. Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) 12. Use data and information gathered to develop an explanation of experimental results 13. Identify patterns in data to explain natural events
SI-M-A5: developing models and predictions using the relationships between data and explanations	14. Develop models to illustrate or explain conclusions reached through investigation 15. Identify and explain the limitations of models used to represent the natural

	world 16. Use evidence to make inferences and predict trends
SI-M-A6: comparing alternative explanations and predictions	17. Recognize that there may be more than one way to interpret a given set of data, which can result in alternative scientific explanations and predictions 18. Identify faulty reasoning and statements that misinterpret or are not supported by the evidence
SI-M-A7: communicating scientific procedures, information, and explanations	19. Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) 20. Write clear step-by-step instructions that others can follow to carry out procedures or conduct investigations 21. Distinguish between *observations* and *inferences* 22. Use evidence and observations to explain and communicate the results of investigations
SI-M-A8: utilizing safety procedures during scientific investigations	23. Use relevant safety procedures and equipment to conduct scientific investigations 24. Provide appropriate care and utilize safe practices and ethical treatment when animals are involved in scientific field and laboratory research
B. Understanding Scientific Inquiry	
BENCHMARKS	**GRADE-LEVEL EXPECTATIONS**
SI-M-B1: recognizing that different kinds of questions guide different kinds of scientific investigations	25. Compare and critique scientific investigations 26. Use and describe alternate methods for investigating different types of testable questions 27. Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving
SI-M-B2: communicating that current scientific knowledge guides scientific investigations	28. Recognize that investigations generally begin with a review of the work of others
SI-M-B3: understanding that mathematics, technology, and scientific techniques used in an experiment can limit or enhance the accuracy of scientific knowledge	29. Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge 30. Describe why all questions cannot be answered with present technologies 31. Recognize that there is an acceptable range of variation in collected data 32. Explain the use of statistical methods to confirm the significance of data (e.g., mean, median, mode, range)
SI-M-B4: using data and logical arguments to propose, modify, or elaborate on	33. Evaluate models, identify problems in design, and make recommendations

principles and models	for improvement
SI-M-B5: understanding that scientific knowledge is enhanced through peer review, alternative explanations, and constructive criticism	34. Recognize the importance of communication among scientists about investigations in progress and the work of others 35. Explain how skepticism about accepted scientific explanations (i.e., hypotheses and theories) leads to new understanding 36. Explain why an experiment must be verified through multiple investigations and yield consistent results before the findings are accepted 37. Critique and analyze their own inquiries and the inquiries of others
SI-M-B6: communicating that scientific investigations can result in new ideas, new methods or procedures, and new technologies	38. Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas
SI-M-B7: understanding that scientific development/technology is driven by societal needs and funding	39. Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) 40. Evaluate the impact of research on scientific thought, society, and the environment

Physical Science: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

A. Properties and Changes of Properties in Matter

BENCHMARKS	GRADE-LEVEL EXPECTATIONS
PS-M-A1: investigating, measuring, and communicating the properties of different substances which are independent of the amount of the substance	1. Measure and record the volume and mass of substances in metric system units 2. Calculate the density of large and small quantities of a variety of substances (e.g., aluminum foil, water, copper, clay, rock)
PS-M-A2: understanding that all matter is made up of particles called atoms and that atoms of different elements are different	3. Construct models that replicate atomic structure for selected common elements from the periodic table
PS-M-A3: grouping substances according to similar properties and/or behaviors	4. Differentiate between the physical and chemical properties of selected substances 5. Compare physical and chemical changes
PS-M-A4: understanding that atoms and molecules are perpetually in motion	6. Draw or model the movement of atoms in solid, liquid, and gaseous states 7. Simulate how atoms and molecules have kinetic energy exhibited by constant motion

PS-M-A5: investigating the relationships among temperature, molecular motion, phase changes, and physical properties of matter	8. Determine the temperatures at which water changes physical phases (e.g., freezing point, melting point, boiling point)
PS-M-A6: investigating chemical reactions between different substances to discover that new substances formed may have new physical properties and do have new chemical properties	9. Describe the properties of reactants and products of chemical reactions observed in the lab
PS-M-A7: understanding that during a chemical reaction in a closed system, the mass of the products is equal to that of the reactants	10. Identify the average atomic masses of given elements using the periodic table 11. Compare the masses of reactants and products of a chemical reaction
PS-M-A8: discovering and recording how factors such as temperature influence chemical reactions	12. Determine the effect of particle size of the same reactants on the rate of chemical reactions during a lab activity (e.g., powdered vs. solid forms)
PS-M-A9: identifying elements and compounds found in common foods, clothing, household materials, and automobiles	13. Use a variety of resources to identify elements and compounds in common substances
B. Motion and Forces	
BENCHMARKS	**GRADE-LEVEL EXPECTATIONS**
PS-M-B1: describing and graphing the motions of objects	14. Construct and analyze graphs that represent one-dimensional motion (i.e., motion in a straight line) and predict the future positions and speed of a moving object 15. Explain why velocity is expressed in both speed and direction 16. Compare line graphs of acceleration, constant speed, and deceleration
PS-M-B2: recognizing different forces and describing their effects (gravity, electrical, magnetic)	17. Describe and demonstrate that friction is a force that acts whenever two surfaces or objects move past one another 18. Explain how the resistance of materials affects the rate of electrical flow
PS-M-B3: understanding that, when an object is not being subjected to a force, it will continue to move at a constant speed and in a straight line	19. Identify forces acting on all objects Also see GLE #22
PS-M-B4: describing how forces acting on an object will reinforce or cancel one another, depending upon their direction and magnitude	20. Draw and label a diagram to represent forces acting on an object 21. Determine the magnitude and direction of unbalanced (i.e., net) forces acting on an object
PS-M-B5: understanding that unbalanced forces will cause changes in the speed or direction of an object's motion	22. Demonstrate that an object will remain at rest or move at a constant speed and in a straight line if it is not subjected to an unbalanced force 23. Predict the direction of a force applied to an object and how it will change the speed and direction of the object

C. Transformations of Energy	
BENCHMARKS	**GRADE-LEVEL EXPECTATIONS**
PS-M-C1: identifying and comparing the characteristics of different types of energy	24. Describe and give examples of how all forms of energy may be classified as potential or kinetic energy 25. Compare forms of energy (e.g., light, heat, sound, electrical, nuclear, mechanical) 26. Describe and summarize observations of the transmission, reflection, and absorption of sound, light, and heat energy
PS-M-C2: understanding the different kinds of energy transformations and the fact that energy can be neither destroyed nor created	27. Explain the relationship between work input and work output by using simple machines 28. Explain the law of conservation of energy 29. Compare and/or investigate the relationships among work, power, and efficiency 30. Trace energy transformations in a simple system (e.g., flashlight)
PS-M-C3: understanding that the sun is a major source of energy and that energy arrives at the Earth's surface as light with a range of wavelengths	31. Compare types of electromagnetic waves
PS-M-C4: observing and describing the interactions of light and matter (reflection, refraction, absorption, transmission, scattering)	32. Identify and illustrate key characteristics of waves (e.g., wavelength, frequency, amplitude) 33. Predict the direction in which light will refract when it passes from one transparent material to another (e.g., from air to water, from prism to air) 34. Apply the law of reflection and law of refraction to demonstrate everyday phenomena (e.g., how light is reflected from tinted windows, how light is refracted by cameras, telescopes, eyeglasses) 35. Determine through experimentation whether light is reflected, transmitted, and/or absorbed by a given object or material 36. Explain the relationship between an object's color and the wavelength of light reflected or transmitted to the viewer's eyes
PS-M-C5: investigating and describing the movement of heat and the effects of heat in objects and systems	37. Compare how heat is transferred by conduction, convection, and radiation 38. Identify conditions under which thermal energy tends to flow from a system of higher energy to a system of lower energy
PS-M-C6: describing the types of energy that can be involved, converted, or released in electrical circuits	39. Describe how electricity can be produced from other types of energy (e.g., magnetism, solar, mechanical)

PS-M-C7: understanding that energy is involved in chemical reactions	40. Identify heat energy gains and losses during exothermic and endothermic chemical reactions
PS-M-C8: comparing the uses of different energy resources and their effects upon the environment	41. Identify risks associated with the production and use of coal, petroleum, hydroelectricity, nuclear energy, and other energy forms

Life Science: Students will become aware of the characteristics and life cycles of organisms and understand their relationships to each other and to their environment.

There are no Grade-Level Expectations for benchmarks in grade 6 for this standard.

Earth and Space Science: Students will develop an understanding of the properties of earth materials, the structure of the Earth's system, the Earth's history, and the Earth's place in the universe.

There are no Grade-Level Expectations for benchmarks in grade 6 for this standard.

Science and the Environment: Students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world.

BENCHMARKS	GRADE-LEVEL EXPECTATIONS
SE-E-A6: distinguishing between renewable and nonrenewable resources and understanding that nonrenewable natural resources are not replenished through the natural cycles and thus are strictly limited in quantity	42. Identify energy types from their source to their use and determine if the energy types are renewable, nonrenewable, or inexhaustible 43. Explain how the use of different energy resources affects the environment and the economy 44. Explain how an inexhaustible resource can be harnessed for energy production 45. Describe methods for sustaining renewable resources 46. Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life
SE-M-A8: investigating and analyzing how technology affects the physical, chemical, and biological factors in an ecosystem	47. Illustrate how various technologies influence resource use in an ecosystem (e.g., forestry management, soil conservation, fishery improvement)

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