



TEST DESIGN AND FRAMEWORK

TEST DESIGN

Middle Grades Science

The **Middle Grades Science** assessment consists of **one test**. The test contains a section with selected-response questions and a section with constructed-response assignments. Each section counts for a percentage of your total test score. The areas of content assessed, the approximate number of selected-response questions and constructed-response assignments in each content area, and the percentage of your total test score derived from each test section are shown in the table below. Further information regarding the content included in each subarea can be found in the test framework.

■ Middle Grades Science (Test Code 014)

Subareas:	Objectives	Approximate Number of Selected-Response Questions	Constructed-Response Assignments
➤ Earth Science	0001–0005	15	
➤ Life Science	0006–0010	15	
➤ Physical Science	0011–0016	18	1
➤ Characteristics of Science	0017–0020	12	1
	TOTAL	60	2
	Percentage of Test Score	80%	20%



Georgia Assessments for the
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TEST FRAMEWORK

Middle Grades Science

EARTH SCIENCE

0001 Understand current scientific views of the universe.

For example:

- demonstrating knowledge of the development of theories about the formation of the universe and the solar system
- demonstrating knowledge of characteristics and general locations of objects in the solar system and universe
- recognizing the effects of gravity on the motion of objects in the solar system
- analyzing the motion of objects in the sky in terms of relative position
- recognizing the effects of the orientations, positions, and movements of the earth, moon, and sun
- identifying the methods and types of technology used to observe and collect data about the solar system and universe

0002 Understand the characteristics and distribution of water and its role in the earth's processes.

For example:

- identifying the properties of water in its different physical states
- analyzing the water cycle and its relationship to various atmospheric conditions
- identifying major reservoirs of water on the earth (i.e., glaciers, lakes, groundwater, oceans) and their distribution
- demonstrating knowledge of the composition, location, and subsurface topography of the world's oceans
- identifying the causes and effects of waves, currents, and tides
- demonstrating knowledge of freshwater resources

0003 Understand characteristics of the atmosphere and of climate and weather.

For example:

- identifying the basic composition, structure, and properties of the atmosphere
- analyzing the significance of changes in weather variables (e.g., clouds, humidity, wind speed)
- recognizing the effects of large bodies of water, large land areas, and differences in elevation on weather and climate
- demonstrating knowledge of weather patterns and the causes and effects of local and regional weather events (e.g., thunderstorms, hurricanes)
- analyzing global weather and climate patterns
- recognizing the methods and types of technology used to observe, measure, and predict climate and weather

0004 Understand characteristics of the earth and processes that have shaped its surface.

For example:

- demonstrating knowledge of the earth's structure and composition
- classifying rocks and minerals based on their process of formation and characteristics
- identifying the characteristics of soil and analyzing how it forms
- analyzing constructive and destructive processes that form and change major geological features (e.g., tectonic movements, erosion, deposition)
- demonstrating knowledge of the theory of plate tectonics and evidence that supports the theory
- recognizing characteristics of fossils and how they show evidence of the changing surface and climate of the earth

0005 Understand the types and uses of the earth's natural resources.

For example:

- identifying types, characteristics, and uses of renewable and nonrenewable resources
- recognizing the sun as the major source of energy on the earth's surface and analyzing its relationship to wind and water energy
- identifying the effects of natural events and human activities on the earth's natural resources
- demonstrating knowledge of methods for conserving and protecting natural resources

LIFE SCIENCE

0006 Understand the diversity of living organisms and their classification.

For example:

- identifying criteria used to classify organisms based upon a six-kingdom system
- recognizing the distinguishing characteristics of different groups of organisms
- recognizing the features of dichotomous keys and their development and use

0007 Understand the structure and function of living systems.

For example:

- identifying characteristics of prokaryotic and eukaryotic cells
- comparing and contrasting the structures and functions of plant and animal cells
- demonstrating knowledge of the relationship between cell structures and their functions
- recognizing basic characteristics of living things (e.g., reproducing, obtaining nutrients)
- demonstrating knowledge of the characteristics of plant structures (e.g., roots, stems, leaves) and the functional relationships that connect them
- demonstrating knowledge of cells, tissues, organs, and organ systems in animals and the functional relationships that connect them
- recognizing the characteristics and functions of major organ systems in the human body

0008 Understand the principles and processes of the inheritance of biological traits.

For example:

- recognizing the role of DNA and RNA in the transmission of genetic information
- demonstrating knowledge of the roles of genes and chromosomes in the transfer of biological traits between generations
- differentiating sexual and asexual reproduction in organisms
- demonstrating knowledge of the basic principles of inheritance and Mendel's laws
- solving problems involving the probability of inheriting a specific trait (e.g., dominant/recessive, incomplete dominant, sex-linked, multiple-allele)
- identifying applications of genetic engineering technology (e.g., agriculture, medicine, forensics)

0009 Understand the dependence of organisms on one another and understand the flow of energy and matter in ecosystems.

For example:

- identifying the roles of producers, consumers, and decomposers in ecosystems
- demonstrating knowledge of the flow of energy and matter through a food web, food chain, or ecosystem
- evaluating how changes in environmental conditions can affect the survival of individuals or entire species
- recognizing the types and characteristics of relationships between organisms (e.g., competition, parasitism, mutualism)
- demonstrating knowledge of harmful and beneficial microorganisms
- identifying characteristics of the earth's major terrestrial biomes (e.g., tropical rain forest, desert, tundra) and aquatic communities (e.g., freshwater, estuarine, marine)

0010 Understand the theory of evolution and the role of natural selection.

For example:

- recognizing the roles of variation and natural selection in the process of evolution
- recognizing evidence for the evolution of species (e.g., Darwin's finches, fossils, genetics)
- identifying and comparing features and behaviors of organisms that allow them to survive or reproduce more effectively than organisms that do not have those features or behaviors (e.g., camouflage, use of hibernation, protection)
- demonstrating knowledge of factors that affect the evolution of species (e.g., geographic isolation, genetic mutations)

PHYSICAL SCIENCE**0011 Understand the nature of matter and its classification.**

For example:

- demonstrating knowledge of the difference between pure substances (e.g., elements, compounds) and mixtures (e.g., solutions, alloys)
- identifying the component parts of a substance (e.g., atoms, ions, molecules)
- distinguishing between physical and chemical properties of matter (e.g., density, melting point, combustibility)
- identifying the characteristics of ionic and covalent chemical bonds and their influence on the chemical and physical properties of a substance
- demonstrating knowledge of the organization of the Periodic Table and its relationship to the properties of matter
- identifying chemical symbols and interpreting formulas

0012 Understand changes in matter.

For example:

- identifying physical, chemical, and nuclear changes in matter and examples of those changes in everyday life
- applying knowledge of the law of conservation of matter to the analysis of physical changes and chemical changes (e.g., cutting, dissolving, forming a precipitate)
- recognizing the characteristics of physical states of matter (e.g., temperature, density, molecular motion)
- identifying the properties of solutions (e.g., concentration, pH, conductivity)
- analyzing factors that affect rates of physical changes and chemical reactions (e.g., temperature, catalysts)

0013 Understand principles and concepts related to energy.

For example:

- comparing the characteristics of different forms of energy (e.g., heat, light, kinetic, potential)
- applying knowledge of the law of conservation of energy to the analysis of physical and chemical changes
- recognizing the relationship between potential energy and kinetic energy
- demonstrating knowledge of energy transformations and the processes by which energy is transferred (i.e., conduction, radiation, convection)
- interpreting diagrams that illustrate changes in the physical states of matter (e.g., phase diagrams)
- applying knowledge of the kinetic molecular model to the analysis of the properties and behaviors of matter as solids, liquids, gases, and plasmas

0014 Understand the relationships among force, mass, and motion of objects.

For example:

- distinguishing between the mass and weight of an object
- identifying characteristics of forces that act on objects (e.g., frictional, gravitational)
- determining the relationship between the velocity and acceleration of an object
- solving quantitative problems involving force, mass, and motion of objects
- demonstrating knowledge of Newton's three laws of motion and their applications to everyday situations
- applying knowledge of the concepts of work and power to the analysis of everyday activities
- demonstrating knowledge of types and characteristics of simple machines and their effect on work

0015 Understand the properties of waves, sound, and light.

For example:

- recognizing the characteristics of mechanical waves (e.g., wavelength, amplitude)
- demonstrating knowledge of the properties of sound in everyday phenomena (e.g., echoes, Doppler effect)
- recognizing how the behavior of waves is affected by the medium (e.g., air, water, solids) through which the waves are passing
- recognizing characteristics of the electromagnetic spectrum
- identifying the effect of mirrors, lenses, and prisms on the behavior of light
- demonstrating knowledge of the relationship between the properties of waves and how they are perceived by humans (e.g., color, pitch)

0016 Understand electricity and magnetism.

For example:

- recognizing the characteristics of static electricity
- demonstrating knowledge of the components of an electric circuit and their functions
- comparing series and parallel circuits
- identifying the properties of magnets and the characteristics of magnetic fields
- demonstrating knowledge of the relationship between moving electric charges and magnetic fields and applications of electromagnetism in everyday life (e.g., motors, generators)

CHARACTERISTICS OF SCIENCE

0017 Understand the characteristics of scientific knowledge and the process of scientific inquiry.

For example:

- demonstrating knowledge of the nature, purpose, and characteristics of science (e.g., reliance on verifiable evidence) and the limitations of science in terms of the kinds of questions that can be answered
- recognizing the dynamic nature of scientific knowledge through the continual testing, revision, and occasional rejection of existing theories
- determining an appropriate scientific hypothesis or investigative design for addressing a given problem
- identifying the characteristics and uses of various types of scientific investigations (e.g., observation, controlled experiment)
- demonstrating knowledge of the principles and procedures for designing and carrying out scientific investigations (e.g., changing one variable at a time)
- recognizing the importance of and strategies for avoiding bias in scientific investigations

0018 Understand scientific tools, instruments, materials, and safety practices.

For example:

- recognizing procedures for the safe and proper use of scientific tools, instruments, chemicals, and other materials in investigations
- selecting and using appropriate tools and international system (SI) units for measuring objects or substances
- identifying potential safety hazards associated with scientific equipment, materials, procedures, and settings
- demonstrating knowledge of procedures for the ethical use and care of living organisms in scientific research
- recognizing appropriate protocols for maintaining safety and for responding to emergencies during classroom laboratory activities

0019 Understand skills and procedures for analyzing data and communicating science.

For example:

- recognizing the concepts of precision, accuracy, and error and identifying potential sources of error in gathering and recording data
- applying appropriate mathematical concepts and computational skills to analyze data
- identifying methods (e.g., tables, graphs) and criteria for organizing data to aid in the analysis of data (e.g., detecting patterns)
- recognizing that there may be more than one way to interpret a given set of findings
- demonstrating knowledge of the use of data to support or challenge scientific arguments and claims
- identifying appropriate methods for communicating the outcomes of scientific investigations (e.g., publications reviewed by peers)
- demonstrating familiarity with effective resources and strategies for reading to gain information about science-related topics and developing subject-area vocabulary
- demonstrating knowledge of conventions and strategies for scientific writing (e.g., lab reports)

0020 Understand the unifying concepts of science and technology.

For example:

- demonstrating knowledge of the unifying concepts (e.g., system, model, change, scale) of science and technology
- recognizing the characteristics of systems, how the components of a system interact, and how different systems interact
- identifying types and characteristics of models used in science and technology, including the advantages and limitations of models