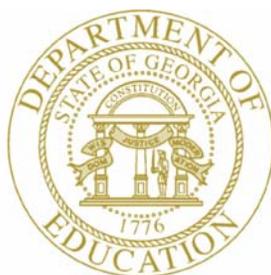




# Content Descriptions

Based on the Georgia Performance Standards

## Biology



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*"Making Education Work for All Georgians"*

## **Introduction**

The State Board of Education is required by Georgia law (A+ Educational Reform Act of 2000, O.C.G.A. §20-2-281) to adopt End-of-Course Tests (EOCT) designed to measure student achievement in core subjects in grades nine through twelve. With educator input and State Board of Education approval, eight content areas were designated in 2001 to be tested. The Georgia Performance Standards (GPS) were adopted by the State Board of Education in July 2004, and the Biology EOCT was developed based on these standards.

## **Program Purpose**

The EOCT are designed to improve student achievement by assessing student performance on the standards specific to each course tested. Student performance on each EOCT is provided to schools for diagnostic and remedial use. These results are used to help make instruction more effective and to ensure that all Georgia students have access to a rigorous curriculum that meets high academic standards. These results are also used for student accountability and to gauge the quality of education in the state. The EOCT are the final exams for each EOCT course. For students in grade 10 or above beginning the 2011-2012 school year, the final grade in each course is calculated by weighing the course grade 85% and the EOCT score 15%. For students in grade 9 beginning the 2011-2012 school year and later, the final grade in each course is calculated by weighing the course grade 80% and the EOCT score 20% (State Board Rule 160-4-2-.13). The student must have a final grade of at least 70 to pass the course and to earn credit toward graduation.

## **EOCT Content Descriptions**

The EOCT Content Descriptions are provided to acquaint Georgia educators with the content coverage of the EOCT. Only the knowledge, concepts, and skills addressed in the GPS are assessed on the EOCT. Committees of Georgia educators reviewed the curriculum and provided guidance for the assessment program.

It is important to note that some curricular standards are better suited for classroom or individual assessment rather than large-scale, summative assessment. While those curricular standards designed for classroom/individual assessment are not included in the Content Descriptions, the knowledge, concepts, and skills outlined are often required for the mastery of the standards that are assessed. Therefore, the EOCT Content Descriptions are in *no way* intended to substitute for the GPS; they are provided to help educators better understand how the curriculum will be assessed. Further, the EOCT Content Descriptions *by no means* suggest *when* concepts and skills should be introduced in the instructional sequence; rather, their purpose is to communicate when concepts and skills will be assessed on the EOCT. Georgia law requires educators to teach the standards set forth in the state-adopted curriculum (i.e., the GPS). The GPS are located at [www.georgiastandards.org](http://www.georgiastandards.org).

## **Biology Domains**

In order to provide reliable measures of student achievement, as well as to give structure to the assessment program, the content standards contained in the GPS were grouped into content domains. Five domains were identified for Biology:

- **Cells**  
*Assessment in this domain focuses on understanding cell structure and organization and the function of cell organelles; identifying the four major macromolecules and their function within the living cell; comprehending how and why homeostasis is essential for life; understanding the impact of water on life processes.*
- **Organisms**  
*Assessment in this domain focuses on comparing the similarities and differences in single-celled and multi-celled organisms in regard to increasing complexity of systems; comprehending the need and abilities of organisms to obtain and utilize nutrients and energy; examining the basis and development of the current six kingdom classification system; comparing and contrasting viruses with living organisms.*
- **Genetics**  
*Assessment in this domain focuses on explaining the structure and role of DNA and RNA in living organisms and how changes in these nucleic acids can affect an organism; comprehending Mendelian genetics and the role of meiosis in genetics; examining DNA technology and its effect on various industries; understanding the differences and similarities in sexual and asexual reproduction.*
- **Ecology**  
*Assessment in this domain focuses on identifying the interdependence of organisms and their environment; comprehending the recycling of nutrients within a system and the flow of energy through that system; recognizing the effect man has made on the environment; examining the adaptations of plants and animals to an ever-changing world.*
- **Evolution**  
*Assessment in this domain focuses on comprehending the role of natural selection and rates of evolution in the success of a species; understanding the scientific evidence for natural selection and evolution; explaining the effect of natural selection and evolution on life in terms of biodiversity and ancestry; recognizing the development of scientific theories of evolution throughout history.*

## **Characteristics of Science**

The GPS in science requires that content be taught in conjunction with process skills identified as the Characteristics of Science. Characteristics of Science refers to the process skills used in the learning and practice of science, such as testing a hypothesis, record keeping, using correct safety procedures, using appropriate tools and instruments, applying math and technology, analyzing data, interpreting results, and communicating scientific information. It also refers to understanding how science knowledge grows and changes and the processes that drive those changes.

The concepts and skills inherent in Characteristics of Science are integrated in items across the five content domains.

### **Overview of the Characteristics of Science**

- Students will understand and apply the skills and knowledge needed to conduct and interpret scientific experiments, including safety as applied to specific biological situations, including:
  - using appropriate metric measurements
  - understanding types of variables in an experiment
  - assessing the validity of methods for collecting, graphing, analyzing, and interpreting data
  - evaluating experimental designs for their intended outcome
  - determining the appropriate display and use of data from an experiment
  - distinguishing between qualitative and quantitative data
  - recognizing the relationship between accuracy and precision in scientific investigations
  - evaluating safe and unsafe lab practices
  - synthesizing scientific inferences based on the information provided
  - constructing appropriate conclusions based on experimental data
  - solving simple problems using equations or dimensional analysis
  - compiling evidence from multiple sources to form conclusions that are coherent and scientifically defensible
  - analyzing discrepancies in recorded data and conclude possible sources of the error
  - understanding the ever-changing nature of science and how scientific views of universal principles may change as additional data becomes available
  - understanding that experimental conclusions often lead to additional questions and investigations

### **Associated GPS Standards**

SCSh1 through SCSh8 within content from SB1 through SB5

## **Biology**

### **Domain: Cells**

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#### **Overview of the Domain**

- Students will analyze the nature of the relationships between structures and functions in living cells.
  - Students will differentiate between prokaryotes and eukaryotes, single-celled and multi-celled organisms.
  - Students will identify common cellular organelles and describe the function of each.
  - Students will explain homeostasis and describe the transport of materials through cell membranes.
  - Students will understand how cellular functions are influenced by the actions of enzymes.
  - Students will identify the functions of the four main macromolecules.
  - Students will explain the impact of water on life processes.

#### **Associated GPS Standard**

SB1

#### **Associated GPS Concepts and Skills**

Assessment of this domain will focus on the following:

- the relationship between form and function in all cells
  - relating common organelles to their functions. These organelles include, but are not limited to:
    - mitochondrion
    - Golgi apparatus
    - vacuole
    - nucleus
    - ribosome
    - chloroplast
  - differentiating between prokaryotes and eukaryotes
  - comprehending the role of the cell membrane in maintaining a constant internal environment
  - understanding the mechanisms (active and passive transport) required to maintain homeostasis in single-celled and multi-celled organisms
  - determining chemical elements that are essential constituents of organic molecules
  - comparing the function of basic organic molecules in cells
  - determining the properties of basic macromolecules in living organisms
  - comprehending the lock and key action of enzymes in catalyzing biological reactions
  - understanding the role of water in osmosis and diffusion

## **Biology**

### **Domain: Organisms**

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#### **Overview of the Domain**

- Students will derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.
  - Students will explain the process of obtaining and utilizing energy within each kingdom.
  - Students will describe the constant cycling of ATP-ADP.
  - Students will be familiar with the processes of photosynthesis and respiration and their role in the energy cycle.
  - Students will compare how structures and function of those structures vary between the six kingdoms.
  - Students will examine the evolutionary basis of modern classification systems.
  - Students will compare and contrast viruses with living organisms.

#### **Associated GPS Standard**

SB3

#### **Associated GPS Concepts and Skills**

Assessment of this domain will focus on the following:

- energy is needed by all organisms to carry out processes within the cell
  - understanding how organisms obtain the energy needed to sustain life
  - analyzing the processes of energy transformation and conversion within types of organisms, such as plants and animals
  - comparing the complexity of organisms to their method of obtaining energy
  - determining how energy is stored and released from the ATP-ADP cycle
- modern classification systems have an evolutionary basis
  - relating the pattern of increasing complexity of organ systems to the theory of evolution
  - understanding how shared characteristics within a common classification may indicate a common ancestor
  - explaining how phylogenetic trees and cladograms show evolutionary relationships
  - selecting common sequences of DNA as evidence of shared ancestry
- viruses have both similarities and differences with living organisms

## **Biology**

### **Domain: Genetics**

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#### **Overview of the Domain**

- Students will analyze how biological traits are passed on to successive generations.
  - Students will distinguish the structure and function of DNA from that of RNA.
  - Students will comprehend Mendel’s laws of genetics and how these laws affect variability within a species.
  - Students will analyze the effects of genetic alterations on subsequent generations.
  - Students will compare and contrast sexual and asexual reproductive outcomes.
  - Students will evaluate the use of DNA technology in today’s society.

#### **Associated GPS Standard**

SB2

#### **Associated GPS Concepts and Skills**

Assessment of this domain will focus on the following:

- DNA and RNA are two molecules essential for the transmission of genetic information
  - comprehending the role of DNA in cellular replication prior to mitosis
  - understanding the roles of DNA and RNA during meiosis
- the laws of genetics, put forth by Mendel, can be used to explain genetic variability
  - analyzing the effects of the law of independent assortment on genetic crosses
  - applying the concepts within the law of segregation to genetic crosses
  - predicting the genotypic and phenotypic outcome of genetic crosses
  - evaluating the role of each of these laws throughout the process of meiosis
- alteration to the genetic material of germ cells can result in variation beyond that explained by Mendelian genetics
  - evaluating the role of genetic variation in successive generations
  - analyzing the possible alterations that can occur during meiosis:
    - insertion
    - deletion
    - substitution
  - describing mutagenic factors found in the environment
- sexual reproduction results in genetic variation; asexual reproduction results in offspring identical to their parents
- DNA technology is changing modern industries
  - evaluating the results of DNA comparisons in forensic sciences
  - justifying the use of gene therapy in medicine
  - predicting the effect of recombinant DNA on agricultural sciences

## **Biology**

### **Domain: Ecology**

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#### **Overview of the Domain**

- Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.
  - Students will investigate the interdependence of organisms within an ecosystem and the connections between ecosystems on Earth.
  - Explain flow of matter and energy through ecosystems.
  - Students will comprehend successional changes in an ecosystem after a disturbance.
  - Students will analyze the effects humans have had on their environment and possible solutions to human-made environmental problems.
  - Students will explain how animal and plant adaptations help species to survive in a changing environment.

#### **Associated GPS Standard**

SB4

#### **Associated GPS Concepts and Skills**

Assessment of this domain will focus on the following:

- understanding the relationship of the individual to a population, a community, an ecosystem, and a biome
- assessing the flow of energy and matter through an ecosystem and required components of a successful environment
  - food chains
  - food webs
  - energy pyramids
  - nutrient cycling
- explaining the negative impact humans have had on Earth
  - pollution
  - proposed global warming
  - explosive population
  - pesticide and herbicide usage
  - resource consumption, renewable and non-renewable
- evaluating the adaptive responses of organisms to their environments
  - plant tropisms
  - animal behavior
  - survival strategies

## **Biology**

### **Domain: Evolution**

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#### **Overview of the Domain**

- Students will evaluate the role of natural selection in the development of the theory of evolution.
  - Students will investigate the theory of evolution and how it pertains to the biological history of Earth.
  - Students will recognize the scientific evidence for natural selection.
  - Students will recognize the advantages of adaptability in the survival and fitness of a species.

#### **Associated GPS Standard**

SB5

#### **Associated GPS Concepts and Skills**

Assessment of this domain will focus on the following:

- understanding how scientific theories are developed
- comparing the history of life in terms of geologic history of a species
  - biodiversity
  - ancestry
  - rate of evolution
- evaluating the scientific evidence that supports the theory of evolution
  - fossil record
  - biochemistry
  - embryologic development
  - homologous structures
- analyzing the effect of natural selection on species
- understanding chemical resistance as a modern example of biological evolution