Secondary (Grades 6-12) Science

Introduction: The Alabama Course of Study: Science defines what learners should know and be able to accomplish after each grade level or course in order to be scientifically literate citizens upon graduation. This document was created by the Science Course of Study Committee and Task Force consisting of educators from kindergarten through college, education specialists, public school administrators, and business and community leaders. Teachers with expertise in special populations were present with the committee and task force to offer advice, perspective, and professional expertise as the group considered the supports which are needed for students with special needs. The structure of the Alabama course of study in science reflects the approach outlined by the National Research Council's 2012 document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. The 2023 Alabama Course of Study: Science incorporates the three dimensions around which K-12 science and engineering education are built. These dimensions are scientific and engineering practices, crosscutting concepts that unify the study of science through their common application across all domains of science and engineering, and the disciplinary core ideas in the physical, life, and Earth and space sciences and in engineering, technology, and applications of science. Alabama's K-12 science program emphasizes the importance of teaching science every day to every student in every grade. This document provides foundational knowledge and learning progressions that are coherent, vertically aligned, and increasingly rigorous. The standards are designed to prepare scientifically literate citizens who can evaluate the quality of science information, appreciate science as a way of knowing about the world, and make sound, evidence-based decisions. Effective implementation of the 2023 Alabama Course of Study: Science will help develop confident and capable graduates who are vital to Alabama's economic productivity and our nation's competitiveness in the global market.

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Life Science Curriculum

Grade 7 Life Science is designed to provide students with a foundation of scientific knowledge and ways of exploring the world. It provides an understanding of living organisms, from the smallest cells to complex ecosystems, allowing students to

appreciate the diversity and complexity of life on Earth. Life Science not only imparts knowledge about the natural world but also nurtures critical thinking, ethical reasoning, and practical skills that are valuable in numerous aspects of life and future career paths. This course requires comprehensive learning and the use of reading, writing, and mathematics skills to enhance scientific literacy.

Life Science content focuses on the disciplinary core ideas in the life sciences domain. The first disciplinary core idea, "From Molecules to Organisms: Structures and Processes," focuses on cellular structures, energy, mitosis, and interaction of body systems necessary for growth, development, and maintenance of homeostasis, emphasizing how each system interacts with the others and with external stimuli. The concepts of mitosis and meiosis are presented separately to establish that meiosis is a process of inheritance. Detailed anatomy of organs will be taught in high school Human Anatomy and Physiology, which extends the content of Life Science.

The second disciplinary core idea, "Ecosystems: Interactions, Systems, and Dynamics," is a broad look at energy and ecosystem relationships that impact populations and environments. The third core idea, "Heredity: Inheritance and Variation of Traits," focuses on inheritance of traits, variations, meiosis, and biotechnology as a foundation for the details of nucleotide structure, DNA replication, base-pairing, and protein synthesis, which will come in high school Biology. The fourth core idea, "Unity and Diversity," illustrates classification of organisms and adaptations of organisms due to natural selection.

Embedded in the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to use design strategies in conjunction with knowledge and understanding of science and technology to solve practical problems. Engineering standards
are denoted with a gear icon . Through guided participation in the engineering design process, students will address real-world problems by designing possible solutions to maintain biodiversity and ecosystem services.

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Biology Curriculum

Biology is an inquiry-based course focused on providing all high school students with foundational life science content about the patterns, processes, and interactions among living organisms. It emphasizes depth and detail in a limited number of core ideas rather than memorization of broad factual content.

Each standard's foundational knowledge is integrated with the science and engineering practices to provide students with opportunities to engage in scientific inquiry. Students use both new and prior knowledge to build conceptual understandings based on evidence from their own and others' investigations. They use their own learning and experiences to support claims and engage in argument from evidence and to produce innovative solutions that reflect how scientists formulate explanations.

The standards provide opportunities to create deeper conceptual understanding and

foster scientific literacy for college, career, and citizenship. Resources specific to the local area, scholarly resources (including evidenced-based literature from scientific journals, real-world data, industry studies, and scientific reports), and laboratory investigations should be used to extend and increase the complexity of the core ideas.

The Biology course incorporates safe laboratory investigations where students can actively explore the aspects of living things. Students are encouraged to apply evidence-based reasoning to investigate various structures, processes, and interactions in organisms. Hands-on experiences in the lab spark curiosity and build interest in learning about living things and are especially valuable for students interested in biology-related science, technology, engineering, and mathematics (STEM) careers.

Content standards within this course are organized according to the disciplinary core ideas for the life sciences domain. The first core idea, “From Molecules to Organisms: Structures and Processes,” emphasizes the structure of cells and how their functions are necessary for supporting life, growth, behavior, and reproduction.
The second core idea, “Ecosystems: Interactions, Energy, and Dynamics,” investigates the positive and negative interactions between living organisms and other biotic and abiotic factors, as well as investigating and celebrating Alabama’s biodiversity.

The third core idea, “Heredity: Inheritance and Variation of Traits,” centers on the formation of proteins that affect trait expression (also known as the central dogma of molecular biology); the passing of genetic information through generations; and how environmental factors and errors in DNA replication can contribute to genetic variation. The fourth core idea, “Unity and Diversity,” examines the variation of traits within a population that results in diversity among organisms over a long period of time. This core idea also focuses on analyzing the relatedness between organisms and groups of organisms using phylogenetic trees and cladograms. This approach moves away from the shifting nomenclature in hierarchical taxonomies toward the use of technologies to determine species relatedness.

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Biology
McGraw Hill Education
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Human Anatomy and Physiology Curriculum

Human Anatomy and Physiology addresses the structure and function of human body systems from the cellular level to the organism level in an approach that complements the natural curiosity of high school students. The standards are designed to help students apply their conceptual understanding of the human body to make well-informed, evidence-based decisions by obtaining and critically evaluating new and changing information from the scientific research community.

Human Anatomy and Physiology incorporates safe laboratory investigations allowing students actively to explore the structure and functions of the human body. Students are encouraged to apply evidence-based reasoning to investigate how organs and systems interact to maintain homeostasis. Hands-on experiences in the lab spark curiosity and build interest in learning how the human body works. Laboratory experiences are especially valuable for students interested in health-related science, technology, engineering, and mathematics (STEM) careers.

Embedded in the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to use design strategies in conjunction with knowledge and understanding of science and technology to solve practical problems. Engineering standards are denoted with a gear icon . Through participation in the engineering design process, students will use tools and materials to model a body system.

Although disorders of the human body are not included in the standards, the exploration of disorders can be an extension of learning anatomy and physiology.
Students should use correct scientific and anatomical terminology including directional terms, regions, planes, and cavities when organs and systems are discussed.

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Hole's Human Anatomy & Physiology, Fourteenth Edition
McGraw Hill Education
ISBN: 978-0-07-673970-7

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