

Grade 7

Life Science

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.

Each content standard completes the stem “*Students will...*”

From Molecules to Organisms: Structures and Processes		
Cell Structure and Processes	1. Develop and use a model to explain the functions of specific cell structures necessary for maintaining a stable environment, including the cell membrane, cell wall, chloroplasts, endoplasmic reticulum, golgi apparatus, mitochondria, nucleus, ribosomes, and vacuoles. <ol style="list-style-type: none"> Engage in argument from evidence to support claims of cell theory. Construct an explanation of how prokaryotic and eukaryotic cells differ in structure and function. 	Structure and Function
	c. Plan and carry out an investigation to identify and explain features of a cell’s semi-permeable membrane which enable it to control what enters and exits the cell.	Stability and Change
	2. Construct an explanation of how photosynthesis and cellular respiration cycle matter and establish the flow of energy into and out of an organism. <ol style="list-style-type: none"> Ask questions and construct an explanation of how anaerobic bacteria produce energy in environments with no oxygen. 	Energy and Matter
Growth and Development	3. Construct an explanation of how the process of mitosis maintains complex organisms and ensures new cells with identical genetic information.	Structure and Function
	a. Ask questions and communicate information regarding how errors in mitosis may affect cell division. <i>Example: formation of cancer cells</i>	Cause and Effect
	4. Obtain, evaluate, and communicate information explaining how cells, tissues, and organs of various systems of the human body work together for specific functions, including the circulatory, digestive, muscular, nervous, respiratory, and skeletal systems. <i>Examples: responding to stimuli, moving, breaking down, or transporting nutrients</i>	Systems and System Models

Ecosystems: Interactions, Energy, and Dynamics

Matter and Energy Flow	5. Construct an explanation of how the cycling of matter between abiotic and biotic parts of ecosystems demonstrates the flow of energy and the conservation of matter, including the carbon, nitrogen, and water cycles.	Energy and Matter
Population Dynamics	<p>6. Analyze and interpret data to predict how environmental conditions, genetic factors, and resource availability will impact the growth of individual organisms and populations of organisms in an ecosystem. <i>Examples: location, population size, weather</i></p> <p>7. Analyze and interpret data to explain how density-independent and density-dependent limiting factors in an ecosystem can lead to shifts in populations. <i>Examples: deforestation, disease, drought, fire, human activities, invasive species, succession</i></p>	
Interdependent Relationships	8. Construct an explanation that predicts patterns of interactions between and among organisms in different ecosystems. <i>Examples: competition, predation, mutualism, commensalism, parasitism</i>	Cause and Effect
Biodiversity	<p>9.  Design a solution to maintain biodiversity and ecosystem services in a given scenario. <i>Examples: considering economic and social factors when making decisions about purifying water, recycling nutrients, preventing soil erosion, improving conditions for threatened and endangered species</i></p> <p>10. Obtain, evaluate, and communicate information about characteristic animal behaviors and specialized plant structures and their effect on the probability of successful reproduction. <i>Examples: building nest to protect young from cold, flower characteristics that attract pollinators</i></p>	

Heredity: Inheritance and Variation of Traits

Genetics and Biotechnology	<ol style="list-style-type: none"> 11. Develop and use models to demonstrate how genetic variations between parents and offspring result from differences in inherited genes located on chromosomes. <i>Examples: monohybrid crosses using Punnett squares, homozygous and heterozygous allele pairs, phenotypes and genotypes, variants</i> 12. Develop and use models to explain how genes are expressed through the flow of genetic information from DNA to RNA to a functional protein. 13. Develop and use models to explain that meiosis results in new genetic combinations with increased variation. <ol style="list-style-type: none"> a. Construct an explanation of the advantages and disadvantages of asexual and sexual reproduction. <i>Examples: budding and binary fission occurring quickly, but with little variation; sexual reproduction requiring two organisms, but with increased variation</i> b. Construct an explanation from evidence of how genetic variants may result in harmful, beneficial, or neutral effects on the structure and function of an organism. 14. Obtain, evaluate, and communicate information on the use of technologies that impact the inheritance and appearance of traits in organisms. <i>Examples: genetic engineering, gene therapy, selective breeding, genetically modified organisms</i> 	Cause and Effect
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Unity and Diversity

Phylogenetics	<p>15. Analyze and interpret data from examination of fossils, relict species, and modern organisms to determine patterns of change in anatomical structures over time. <i>Example: Use a cladogram or phylogenetic tree.</i></p> <p>16. Obtain, evaluate, and communicate evidence comparing patterns in the embryological development of multiple species to identify relationships not evident in the fully formed adult anatomy. <i>Example: Use pictorial evidence of development of different species.</i></p>	Patterns
Natural Selection	<p>17. Ask questions to clarify how natural selection over generations may lead to changes in the frequency of specific traits to enhance survival and reproduction of a population.</p>	Cause and Effect