

Grade 7 Science Units:

From Molecules to Organisms

The performance expectations in LS1: From Molecules to Organisms: Structures and Processes help students formulate an answer to the question, “How can one explain the ways cells contribute to the function of living organisms.” The LS1 Disciplinary Core Idea from the NRC Framework is organized into four sub-ideas: Structure and Function, Growth and Development of Organisms, Organization for Matter and Energy Flow in Organisms, and Information Processing. Students can gather information and use this information to support explanations of the structure and function relationship of cells. They can communicate understanding of cell theory. They have a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. The understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell. Students can construct an explanation for how environmental and genetic factors affect growth of organisms. They can connect this to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction. Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for the core ideas about processes of living organisms.

- **MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.**
- **MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.**
- **MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.**
- **MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.**
- **MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.**
- **MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.**
- **MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.**
- **MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**

Genetics: Heredity, Inheritance, and Variation of Traits/Heredity and Adaptation (FOSS)

In the Foss **Heredity and Adaptations** unit, students begin to explore the anchor phenomenon of the biodiversity that exists on Earth. The driving question for this course is how can we explain the diversity of life that has lived on Earth? Single-celled archaea that live in incredibly saline pools, an extravagantly feathered bird that courts a mate with song and dance, a fungus that covers over a square mile of forest, nudibranchs that glide along the seafloor, a leopard seal that shoots through Antarctic waters in pursuit of a penguin. Life on Earth is a dizzying array of diversity. Yet all life, no matter the diversity, shares common characteristics. All life is cellular, depending upon cellular processes for survival. And all life shares a genetic organization based on DNA and RNA.

The theory of evolution is the unifying principle that explains both the similarity and diversity of life. Evolution forms the foundation of

modern biology and is supported by a vast array of observable evidence. Middle school students are ready to explore the varied lines of evidence, including the fossil record, the similarities between past and present organisms, the genetic principles of inheritance, and how natural selection produces adaptations that lead to changes in species and eventually the creation of new species.

- **MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.**
- **MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.**
- **MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.**

Ecosystems and Interactions/Matter and Energy/Diversity of Life (FOSS)

The **FOSS Diversity of Life** unit emphasizes the use of knowledge and evidence to construct explanations for the structures and functions of living organisms. Students observe and maintain protists, plants, and animals in the classroom and study their characteristic features. The study progresses from macroscopic to microscopic observation to discover the fundamental unit of life, the cell. Students then investigate organism subsystems and behaviors and consider their diversity of adaptive structures and strategies.

- **MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.**
- **MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.**
- **MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.**
- **MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.**
- **MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.**