

California Middle School Life Science Tutorials offer targeted instruction, practice, and review designed to help students develop scientific literacy, deepen conceptual understanding, and apply scientific practices. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By continually honing their ability to apply knowledge in real-world scenarios, students build the depth of knowledge and higher-order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students as they explore the nature of science through focused content, interactive mini investigations, multi-modal representations, and personalized feedback. The Review It offers a high-impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

These Tutorials are built to the Next Generation Science Standards for life science.

1. NATURE OF SCIENCE

- **WHAT IS SCIENCE?**
- **TYPES OF INVESTIGATIONS**
- **USING MODELS**

2. MEASUREMENT AND DATA

- **TOOLS AND MEASUREMENT**
- **DISPLAYING AND INTERPRETING DATA**

3. NATURE OF LIFE

- **CHARACTERISTICS OF LIFE**
 - **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-LS1-5** *Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.*
- **CHEMISTRY OF LIFE**
 - **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.*
- **PATTERNS OF REPRODUCTION**
 - **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.*

4. CELLS

- **CELL STRUCTURE**

- **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 parts of cells contribute to the function.

- **CELL NUTRITION AND TRANSPORT**

- **MS-LS1-2** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

- **CELL GROWTH AND REPRODUCTION**

- **MS-LS1-2** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- **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.

5. GENETICS

- **INHERITANCE**

- **MS-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- **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.

- **GENES AND DNA**

- **MS-LS1-2** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- **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.

- **BIOTECHNOLOGY**

- **MS-LS4-5** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

6. DIVERSITY OF LIFE

- **DOMAINS AND KINGDOMS OF LIFE**

- **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-LS1-4** 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.

- **CLASSIFICATION OF LIVING THINGS**

- **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.
- **MS-LS4-3** Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

7. MULTICELLULAR BODIES

- **SPECIALIZED CELLS AND TISSUES**

- **MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

- **ORGANS AND BODY SYSTEMS**

- **MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

8. THE HUMAN BODY

- **HUMAN ORGAN SYSTEMS**

- **MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- **MS-LS1-8** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

- **DISEASE AND HUMAN HEALTH**

- **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-LS1-1** Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.

9. RESPONSE TO STIMULI

- **ANIMAL BEHAVIORS**

- **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-LS1-8** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

- **PLANT RESPONSES**

- **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.

10. ECOLOGY

- **CHARACTERISTICS OF ECOSYSTEMS**

- **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.

- **INTERACTIONS IN ECOSYSTEMS**

- **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-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.

- **SUCCESSION AND ECOSYSTEM STABILITY**

- **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.

11. EVOLUTION

- **THEORY OF EVOLUTION**

- **MS-LS4-1** Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- **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.

- **NATURAL SELECTION**

- **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-LS4-4** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- **MS-LS4-6** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.