

Biology

Instructors:

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Prerequisite: Successful completion of Earth Systems 2 semesters, 1 credit

This college preparatory course is required for all sophomores not enrolled in Honors Biology or Conceptual Biology. This lab-intensive course is designed for all students. Concepts covered during the first semester include biological themes and processes, introduction to organic and inorganic chemistry, cells, diffusion, genetics, and photosynthesis. Second semester topics include classification and a review of the five kingdoms of life: bacteria, protists, fungi, plants, and animals. Labs will include practicing proper techniques and analyzing data by providing students with the opportunity to actively investigate scientific problems. Participants will also learn how to write lab reports, conduct basic research, and explore the scientific process.

Graduation Standards (the number of the standard is referenced in the performance indicators listed in each unit):

4- Life Sciences: Structure, Function, and Information Processing Understand and analyze molecular, structural, and chemical biology. (LS 1)

5- Life Sciences: Matter And Energy in Organisms and Ecosystems Understand and analyze the characteristics, functions, and behavioral interactions within an ecosystem. (LS 2)

6- Life Sciences: Growth, Development, and Reproduction of Organisms, Natural Selection, and Adaptations Understand and analyze genetics, adaptation, and biodiversity. (LS 3 + LS 4)

8- Engineering, Technology, and Application of Science Demonstrate engineering concepts across multiple disciplines and novel situations. (HS-ETS1)

- 8 A. Ask questions/ define problems.
- 8 B. Develop and use models.
- 8 C. Plan and carry out investigations.
- 8 D. Analyze and interpret data.
- 8 E. Use mathematical and computational reasoning.
- 8 F. Construct explanations/ design solutions.
- 8 G. Engage in Argument from evidence.
- 8 H. Obtain, evaluate, and communicate information

Unit 1

Biology and You

Summary	Students will understand the nature of scientific thought and scientific methods including SI measurements and lab safety when working with tools and techniques that scientists use in scientific practices. Students will also identify the basic characteristics that are shared by all living things and make personal connections to the importance of studying life science.
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Performance Indicators	4A. Identify the properties of life and make personal connections to the importance of studying life science.
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Assessed in Unit	8- (A-H) Engineering, Technology, and Application of Science Practices
Unit 2	The Chemistry of Life
Summary	A review of basic chemistry (atomic structure and bonding) will lead students to investigate how the molecular structure and chemical bonds found in biomolecules (water, carbohydrates, proteins (including enzymes), lipids, and nucleic acids) account for their functions that enable life on Earth.
Performance Indicators Assessed in Unit	4 B. Demonstrate an understanding of the role of biomolecules (water, proteins, carbohydrates, lipids, and nucleic acids) to life on Earth. 8 (A-H). Engineering, Technology, and Application of Science Practices
Unit 3	Microbes
Summary	Students will explain the characteristics and processes of bacteria and viruses. Students will also learn how bacteria and viruses are beneficial to humans and how they cause disease.
Performance Indicators Assessed in Unit	4 E. Relate structure to function in the anatomy of microscopic organisms/particles (Bacteria, Viruses, Protists) with emphasis on their role in ecosystems. 8 (A-H). Engineering, Technology, and Application of Science Practices
Unit 4	Cell Structure
Summary	Students will study the relationship between the structure and function of both prokaryotic and eukaryotic cells. In addition to identifying key cellular structures, students will discover that even within cell groups specialization occurs to maximize efficiency in the specific role of that cell
Performance Indicators Assessed in Unit	4 C. Compare and contrast cell types and relate cellular structures to their functions. 8 (A-H). Engineering, Technology, and Application of Science Practices
Unit 5	Homeostasis: Membrane Transport
Summary	Students will discover the importance of the cell membrane in communication, cellular identification, and maintaining homeostasis for an organism through scientific investigation.
Performance Indicators Assessed in Unit	4 D. Explain the structure of the cell membrane and how the cell membrane operates in maintaining the homeostasis of a cell. 8 (A-H) Engineering, Technology, and Application of Science Practices
Unit 6	Metabolism: Photosynthesis and Cellular Respiration
Summary	Students will get an introduction to metabolism and how organisms gain and use energy. Students will explore photosynthesis and cellular respiration including organelles involved, steps of each process, and how they relate to one another.
Performance Indicators Assessed in Unit	5 A. Demonstrate an understanding of the processes of cellular respiration and photosynthesis in organisms and role of each in an ecosystem (carbon -oxygen cycle). 8 (A-H) Engineering, Technology, and Application of Science Practices
Unit 7	Cell Reproduction/Division: Mitosis and Meiosis

Summary	Students will describe the significance and process of cell division, correlate the stages of cell division to the growth and maintenance of an organism, and provide sound reasoning as to how meiosis allows for diversity within a population. They will also explore human conditions caused by nondisjunction resulting in atypical chromosome numbers.
Performance Indicators Assessed in Unit	6 A. Compare and contrast forms of cell division and relay the importance of each in its growth, maintenance, and reproduction as well as the diversity of a population. (LS1:B) 8 (A-H). Engineering, Technology, and Application of Science Practices
Unit 8	Mendelian Genetics
Summary	How traits are passed from parent to offspring will be studied, with emphasis on predicting the outcome of a genetic cross and tracing traits through multiple generations to determine inheritance patterns.
Performance Indicators Assessed in Unit	6 B. Accurately show the relationship between genes and their physical expression, and predict the outcome of a genetic cross 8 (A-H). Engineering, Technology, and Application of Science Practices
Unit 9	Molecular Genetics: DNA, RNA, and Protein Synthesis
Summary	Students will learn how the structure of DNA facilitates its roles in replication and protein synthesis and the effects of mutations in DNA.
Performance Indicators Assessed in Unit	6 C. Relate genetic diversity to the molecular structure of DNA and how genetic code translates into the building of proteins. 8- (A-H) Engineering, Technology, and Application of Science Practices
Unit 10	Biological Evolution
Summary	Students will investigate how genetic diversity enables populations to change over time and respond to a changing environment. They will look at the scientific evidence for the process of Natural Selection and explain the process their knowledge of genetics..
Performance Indicators Assessed in Unit	6 D. Describe how living things change over time and respond to one another and their environment. 8- (A-H) Engineering, Technology, and Application of Science Practices