

BIOLOGY, SEMESTER A

COURSE OVERVIEW AND GOALS

Biology focuses on the mastery of basic biological concepts and models while building scientific inquiry skills and exploring the connections between living things and their environment.

The course begins with an introduction to the nature of science and biology, including the major themes of structure and function, matter and energy, and the interconnectedness of life. Students then apply those themes to the structure and function of the cell, cellular metabolism, and biogeochemical cycles. Building on this foundation, students explore the connections and interactions between living things by studying genetics, ecosystems and natural selection, and evolution. The course ends with an applied look at human biology.

Scientific inquiry skills are embedded in the direct instruction, wherein students learn to ask scientific questions, form and test hypotheses, and use logic and evidence to draw conclusions about the concepts.

Lab activities reinforce critical thinking, writing, and communication skills and help students develop a deeper understanding of the nature of science.

This course is built to state standards and informed by the Next Generation Science Standards (NGSS).

By the end of this course, you will be able to do the following:

- ❖ Interpret the interactions of life at various scales, from the chemical components that make up cells to the impact of human populations on the biosphere.
- ❖ Apply practical scientific skills to solve problems and analyze data related to living organisms and systems.
- ❖ Categorize the parts of an organism from the cellular level upward and define the role each plays in homeostasis and other conditions.

COURSE COMPONENTS AND GRADING RUBRIC

The table gives a breakdown of the weight for each component in the course. Weight represents the percentage of the total score coming from each activity.

Course Components	Count	Weight
Pretest. <i>A pretest is an optional assessment, typically designed for credit recovery. If a student shows mastery of a lesson objective, the student may be automatically exempted from the upcoming activities associated with the mastered objective. Each passing pretest grade is entered into the gradebook.</i>	4	0%
Practice. <i>A practice activity provides instruction similar to that found in a study so that students can practice or review skills necessary to complete their assignment with mastery.</i>	2	5%
Discussion. <i>A discussion activity is an opportunity for students to collaborate with their peers. This activity gives students the opportunity to practice speaking and listening in a clear and logical manner and to receive feedback from peers.</i>	2	5%
Explore. <i>An explore activity gives students the opportunity to conduct research, evaluate source materials, and synthesize information.</i>	1	5%
Lab. <i>A lab is a hands-on investigatory activity that can be completed in a couple of class periods. It can include virtual labs, modeling exercises, and engineering design activities.</i>	7	20%
Mastery Test. <i>A mastery test is a computer-scored lesson-level summative assessment.</i>	21	25%
Posttest. <i>A posttest appears at the end of each unit.</i>	4	15%
End-Of-Semester Test. <i>An end-of-semester test (EOS) appears at the end of each course.</i>	1	5%
Teacher-Graded Posttest. <i>A posttest that prompts students for written responses appears at the end of each unit.</i>	4	15%
Teacher-Graded End-Of-Semester Test. <i>An end-of-semester test (EOS) that prompts students for written responses appears at the end of each course.</i>	1	5%

Course Components	Count	Weight
Total	47	100%

*Teachers may manually adjust these weights if desired, per district grading requirements.

UNIT 1: INTRODUCTION TO BIOLOGY

In this unit, you will define biology and apply the tools of scientific inquiry used in the field of biology to uncover patterns in data.

Lesson and Duration	Activities	Objectives
Biological Science 4 hours, 5 minutes	<i>Overview: Biological Science</i> <i>Study: What Is Science?</i> <i>Mastery Test: What Is Science?</i> <i>Study: Biology, Technology, and Society</i> <i>Mastery Test: Biology, Technology, and Society</i> <i>Study: Biology Basics</i> <i>Mastery Test: Biology Basics</i>	- Define science and the scientific process. - Distinguish among scientific hypotheses, theories, and laws. - Determine the relationships among science, technology, and society. - Summarize the characteristics that all living things share. - Compare prokaryotic and eukaryotic cells.
Tools of Inquiry 4 hours, 45 minutes	<i>Overview: Tools of Inquiry</i> <i>Study: Scientific Investigations</i> <i>Mastery Test: Scientific Investigations</i> <i>Study: Modeling</i> <i>Mastery Test: Modeling</i> <i>Study: Data Analysis</i> <i>Mastery Test: Data Analysis</i> <i>Practice: Data Analysis</i>	- Identify the characteristics that all scientific investigations should have. - Apply computer simulations to conduct scientific investigations. - Recognize the benefits and limitations of various types of models used by scientists and engineers. - Summarize how data can be organized and analyzed to find patterns and draw conclusions.

Lesson and Duration	Activities	Objectives
Wrap-Up: Introduction to Biology <i>1 hour, 30 minutes</i>	<i>Review: Introduction to Biology</i> <i>Posttest: Introduction to Biology</i> <i>Teacher-Graded Posttest: Introduction to Biology</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 2: ENERGY AND MATTER IN LIVING SYSTEMS

In this unit, you will classify the building blocks of life and analyze the processes that continually cycle matter and energy through the biosphere.

Lesson and Duration	Activities	Objectives
The Building Blocks of Life <i>7 hours, 5 minutes</i>	<i>Overview: The Building Blocks of Life</i> <i>Study: From Atoms to Biosphere</i> <i>Mastery Test: From Atoms to Biosphere</i> <i>Study: Biomolecules</i> <i>Mastery Test: Biomolecules</i> <i>Study: Energy and Matter in the Biosphere</i> <i>Mastery Test: Energy and Matter in the Biosphere</i> <i>Lab: Modeling the Carbon Cycle</i>	- Identify the building blocks of organisms and more complex living systems. - Analyze the levels of organization in biological systems, and relate the levels to one another and to the whole systems they compose. - Determine how chemical elements can combine to form biomolecules. - Define the basic molecular structures and primary functions of the four major types of biomolecules. - Recognize the role of enzymes in living systems.

Lesson and Duration	Activities	Objectives
		- Examine how matter and energy flow within and between living and nonliving systems. - Analyze the cycling of water, carbon, nitrogen, and oxygen through ecosystems. - Model the carbon cycle and explain the consequences of disrupting this cycle.
Photosynthesis and Cellular Respiration 5 hours, 45 minutes	<i>Overview: Photosynthesis and Cellular Respiration</i> <i>Study: Photosynthesis</i> <i>Mastery Test: Photosynthesis</i> <i>Study: Cellular Respiration</i> <i>Mastery Test: Cellular Respiration</i> <i>Lab: Modeling Photosynthesis and Cellular Respiration</i>	- Identify the reactants, products, and basic functions of photosynthesis. - Recognize how photosynthesis allows plants to change light energy into stored chemical energy. - Analyze photosynthesis by tracing the transfer and storage of energy through its processes. - Identify the reactants, products, and basic functions of cellular respiration and fermentation. - Analyze cellular respiration to trace the flow (storage, release, and transfer) of energy through the breaking and formation of chemical bonds. - Compare the aerobic and anaerobic processes that cells use to make ATP, using models. - Recognize that photosynthesis and cellular respiration are chemical processes, using models.

Lesson and Duration	Activities	Objectives
Investigating Energy and Matter in Living Systems 3 hours, 30 minutes	<i>Overview: Investigating Energy and Matter in Living Systems</i> <i>Lab: Investigating the Flow of Energy and Cycling of Matter</i> <i>Discussion: Investigating the Flow of Energy and Cycling of Matter</i>	Create and revise an explanation for the cycling of matter and flow of energy in aerobic and anaerobic conditions, using evidence.
Wrap-Up: Energy and Matter in Living Systems 1 hour, 30 minutes	<i>Review: Energy and Matter in Living Systems</i> <i>Posttest: Energy and Matter in Living Systems</i> <i>Teacher-Graded Posttest: Energy and Matter in Living Systems</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 3: ECOSYSTEMS

In this unit, you will compare interactions between organisms at different scales, from populations to ecosystems.

Lesson and Duration	Activities	Objectives
Relationships in Ecosystems 3 hours, 25 minutes	<i>Overview: Relationships in Ecosystems</i> <i>Study: Food Chains and Energy Pyramids</i> <i>Mastery Test: Food Chains and Energy Pyramids</i> <i>Study: Changes in Populations</i> <i>Mastery Test: Changes in Populations</i> <i>Practice: Relationships in Ecosystems</i>	- Support claims related to the cycling of matter and flow of energy among organisms in an ecosystem using food chains, food webs, and ecological pyramids. - Analyze factors that cause populations to grow, shrink, or remain stable.

Lesson and Duration	Activities	Objectives
		Identify common interactions among members of a species and between members of different species within an ecosystem.
Ecosystem Stability and Change 7 hours, 15 minutes	<i>Overview: Ecosystem Stability and Change</i> <i>Study: Ecological Succession</i> <i>Mastery Test: Ecological Succession</i> <i>Explore: Changes in Ecosystems</i> <i>Study: Impact of Humans on Ecosystems</i> <i>Mastery Test: Impact of Humans on Ecosystems</i> <i>Lab: Engineering a Solution to Reduce Human Impact</i>	- Recognize the causes and effects of ecosystem stability and instability. - Evaluate information from a variety of sources to explain how climate change affects the stability of ecosystems. - Identify how human activities impact ecosystems and techniques that can be used to limit that impact. - Design, build, test, evaluate, and refine a solution for reducing the impact of human activities on the environment.
Wrap-Up: Ecosystems 1 hour, 30 minutes	<i>Review: Ecosystems</i> <i>Posttest: Ecosystems</i> <i>Teacher-Graded Posttest: Ecosystems</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 4: MULTICELLULAR ORGANISMS

In this unit, you will analyze the roles of cells and groups of cells, such as organs and tissues, in maintaining homeostasis in both animal and plant life.

Lesson and Duration	Activities	Objectives
Growth and Development 5 hours, 45 minutes	<i>Overview: Growth and Development</i> <i>Study: Mitotic Cell Division</i> <i>Mastery Test: Mitotic Cell Division</i> <i>Study: Cell Differentiation</i> <i>Mastery Test: Cell Differentiation</i> <i>Lab: Modeling Cell Division and Differentiation</i>	- Determine how mitotic cell division leads to the growth and maintenance of multicellular organisms. - Evaluate the cell cycle, including the process of mitosis. - Recognize how instructions in DNA lead to cell differentiation and result in cells that are specialized to perform specific functions in multicellular organisms. - Create models to illustrate the roles of cell division and cell differentiation in producing and maintaining complex organisms.
Tissues, Organs, and Body Systems 7 hours, 5 minutes	<i>Overview: Tissues, Organs, and Body Systems</i> <i>Study: Tissues and Organs</i> <i>Mastery Test: Tissues and Organs</i> <i>Study: Animal Systems</i> <i>Mastery Test: Animal Systems</i> <i>Study: Plant Systems</i> <i>Mastery Test: Plant Systems</i> <i>Lab: Modeling Organ System Interactions</i>	- Identify the specialized cells, tissues, and organs of animals and plants, using models. - Relate the structures of specialized cells, tissues, and organs of animals and plants to their functions. - Identify the major parts and basic functions of the animal organ systems. - Recognize interactions that occur among animal organ systems. - Evaluate the structures and major functions of the shoot system and root system of a plant.

Lesson and Duration	Activities	Objectives
		- Relate the structures of plant organs and tissues to the physiological processes of plants. - Illustrate the hierarchical organization of interacting systems in multicellular organisms, using models.
Homeostasis 4 hours, 50 minutes	<i>Overview: Homeostasis</i> <i>Study: Homeostasis</i> <i>Mastery Test: Homeostasis</i> <i>Lab: Investigating Homeostasis</i> <i>Discussion: Investigating Homeostasis</i>	- Recognize how multicellular organisms maintain homeostasis. - Analyze strategies used by desert animals to regulate body temperature, using a virtual lab. - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Wrap-Up: Multicellular Organisms 1 hour, 30 minutes	<i>Review: Multicellular Organisms</i> <i>Posttest: Multicellular Organisms</i> <i>Teacher-Graded Posttest: Multicellular Organisms</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

SEMESTER WRAP-UP

Lesson and Duration	Activities	Objectives
Semester Wrap-Up <i>2 hours, 20 minutes</i>	<i>Review: Semester Review</i> <i>End-of-Semester Test: Semester Exam</i> <i>Teacher-Graded End-of-Semester Test: Semester Exam</i>	• Review what you have learned in this semester. • Demonstrate mastery of concepts and skills from the semester by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the semester by completing a teacher-scored assessment.

COURSE MAP

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the [course map](#).