

BIOLOGY, SEMESTER B

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 flow, systems, 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:

- ❖ Analyze the relationship between DNA replication and its potential effects, including mutation, genetic expression, and, over time, speciation and specialization.
- ❖ Predict the ways that genes cause differences between individual organisms and changes in whole populations and species.

- ❖ Synthesize the current scientific understanding of genetics, natural selection, and heredity to interpret the course of evolution since life began on Earth.

[Lab materials needed for this course](#)

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>	3	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>	3	5%
Explore. <i>An explore activity gives students the opportunity to conduct research, evaluate source materials, and synthesize information.</i>	3	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>	5	20%
Mastery Test. <i>A mastery test is a computer-scored lesson-level summative assessment.</i>	17	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%

Course Components	Count	Weight
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%
Total	45	100%

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

UNIT 1: HEREDITY

In this unit, you will analyze how the process of DNA replication leads to heredity.

Lesson and Duration	Activities	Objectives
Genetic Inheritance <i>2 hours, 45 minutes</i>	<i>Overview: Genetic Inheritance</i> <i>Study: Introduction to Heredity</i> <i>Mastery Test: Introduction to Heredity</i> <i>Study: Chromosomes and DNA</i> <i>Mastery Test: Chromosomes and DNA</i>	- Examine the early history of the field of genetics. - Recognize the structures of DNA and chromosomes.
DNA Replication and Meiosis <i>3 hours, 25 minutes</i>	<i>Overview: DNA Replication and Meiosis</i> <i>Study: DNA Replication</i> <i>Mastery Test: DNA Replication</i> <i>Study: Meiotic Cell Division</i> <i>Mastery Test: Meiotic Cell Division</i> <i>Practice: DNA Replication and Meiosis</i>	- Summarize how a strand of DNA is replicated in a cell. - Summarize the process of meiosis. - Compare mitosis and meiosis and relate them to the processes of sexual and asexual reproduction and the consequences for genetic variation.

Lesson and Duration	Activities	Objectives
Patterns of Inheritance 4 hours, 15 minutes	<i>Overview: Patterns of Inheritance</i> <i>Study: Types of Inheritance</i> <i>Mastery Test: Types of Inheritance</i> <i>Study: Predicting Genetic Outcomes</i> <i>Mastery Test: Predicting Genetic Outcomes</i> <i>Explore: Explaining Heredity</i>	- Identify common patterns of inheritance. - Analyze patterns of inheritance. - Research how scientists know that inheriting specific alleles can increase a person's risk of developing a certain disease by asking questions and gathering evidence.
Wrap-Up: Heredity 1 hour, 30 minutes	<i>Review: Heredity</i> <i>Posttest: Heredity</i> <i>Teacher-Graded Posttest: Heredity</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: GENES AND TRAITS

In this unit, you will evaluate the relationship between protein synthesis and genetic expression at a range of scales, from individual organisms to populations.

Lesson and Duration	Activities	Objectives
Gene Expression 5 hours, 45 minutes	<i>Overview: Gene Expression</i> <i>Study: Protein Synthesis</i> <i>Mastery Test: Protein Synthesis</i> <i>Lab: Modeling Protein Synthesis</i> <i>Study: Regulation of Gene Expression</i>	- Recognize how cells express genes by building proteins. - Create a model to demonstrate how the structure of a segment of DNA determines the structure of the proteins it codes for. - Examine how gene expression is regulated in prokaryotes and eukaryotes.

Lesson and Duration	Activities	Objectives
	<i>Mastery Test: Regulation of Gene Expression</i>	
Genetic Variation 3 hours, 25 minutes	<i>Overview: Genetic Variation</i> <i>Study: Origins of Genetic Variation</i> <i>Mastery Test: Origins of Genetic Variation</i> <i>Study: Population Genetics</i> <i>Mastery Test: Population Genetics</i> <i>Practice: Genetic Variation</i>	- Summarize the origins of genetic variation. - Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Wrap-Up: Genes and Traits 1 hour, 30 minutes	<i>Review: Genes and Traits</i> <i>Posttest: Genes and Traits</i> <i>Teacher-Graded Posttest: Genes and Traits</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: NATURAL SELECTION

In this unit, you will compare the process of natural selection with the changes it manifests in populations over time.

Lesson and Duration	Activities	Objectives
Adaptations 4 hours, 15 minutes	<i>Overview: Adaptations</i> <i>Study: Adaptations in Populations</i> <i>Mastery Test: Adaptations in Populations</i> <i>Explore: Group Behavior and Survival</i>	Recognize how adaptations help organisms survive and reproduce.

Lesson and Duration	Activities	Objectives
	<i>Study: Natural Selection and Population Change</i> <i>Mastery Test: Natural Selection and Population Change</i>	- Research and evaluate evidence on the effect of group behavior on an individual's and a species' chances of surviving and reproducing. - Summarize the process of natural selection. - Determine how natural selection causes populations to change over time.
Natural Selection in Action 6 hours, 30 minutes	<i>Overview: Natural Selection in Action</i> <i>Lab: Investigating Natural Selection</i> <i>Discussion: Investigating Natural Selection</i> <i>Lab: Analyzing Natural Selection</i>	- Determine how natural selection leads to adaptation and changes in species over time, using data gathered in a simulation. - Analyze how natural selection leads to adaptation and changes in species over time, using statistics and probability.
Other Mechanisms of Population Change 3 hours, 30 minutes	<i>Overview: Other Mechanisms of Population Change</i> <i>Lab: Modeling Genetic Drift and Gene Flow</i> <i>Discussion: Modeling Genetic Drift and Gene Flow</i>	Model the effects of genetic drift and gene flow on the variation and distribution of expressed traits in a population.
Wrap-Up: Natural Selection 1 hour, 30 minutes	<i>Review: Natural Selection</i> <i>Posttest: Natural Selection</i> <i>Teacher-Graded Posttest: Natural Selection</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: EVOLUTION

In this unit, you will make predictions about extinction patterns based on an analysis of the theory of evolution, speciation, and the history of life on Earth.

Lesson and Duration	Activities	Objectives
Changes to Earth's Species 4 hours, 45 minutes	<i>Overview: Changes to Earth's Species</i> <i>Study: Darwin's Theory of Evolution</i> <i>Mastery Test: Darwin's Theory of Evolution</i> <i>Study: Modern Research on Evolution</i> <i>Mastery Test: Modern Research on Evolution</i> <i>Study: Speciation and Extinction</i> <i>Mastery Test: Speciation and Extinction</i> <i>Practice: Evolution</i>	- Examine some of the evidence used to support the theory of evolution. - Recognize modern evidence used to support the theory of evolution. - Summarize the causes and results of speciation. - Identify the factors that result in extinction.
The Tree of Life 2 hours, 45 minutes	<i>Overview: The Tree of Life</i> <i>Study: History of Life on Earth</i> <i>Mastery Test: History of Life on Earth</i> <i>Study: Phylogenetic Systematics</i> <i>Mastery Test: Phylogenetic Systematics</i>	- Summarize the history of life on Earth. - Evaluate how and why organisms are hierarchically classified based on evolutionary relationships.
Preventing Extinctions 5 hours	<i>Overview: Preventing Extinctions</i> <i>Explore: Environmental Change and Evolution</i> <i>Lab: Engineering a Solution to Protect Species</i>	- Research and evaluate evidence that environmental changes lead to changes in the distribution in traits in species. - Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Lesson and Duration	Activities	Objectives
	<i>Discussion: Engineering a Solution to Protect Species</i>	
Wrap-Up: Evolution <i>1 hour, 30 minutes</i>	<i>Review: Evolution</i> <i>Posttest: Evolution</i> <i>Teacher-Graded Posttest: Evolution</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>1 hours, 50 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](#).