



SCI500: AP[®] Biology

Course Overview

This course guides students to a deeper understanding of biological concepts including the diversity and unity of life, energy and the processes of life, homeostasis, and genetics. Students learn about regulation, communication, and signaling in living organisms, as well as interactions of biological systems. Students carry out a number of learning activities, including readings, interactive exercises, extension activities, hands-on and virtual laboratory experiments, and practice assessments. These activities are designed to help students gain an understanding of the science process and critical-thinking skills necessary to answer questions on the AP Biology Exam. The content aligns to the sequence of topics recommended by the College Board.

COURSE LENGTH: Two semesters

MATERIALS: Common household materials for labs

PREREQUISITES: Success in Biology, Chemistry, Algebra I, and teacher/school counselor recommendation required; success in Algebra II highly recommended

Course Outline

SEMESTER ONE

Unit 1: Evolution: The Diversity and Unity of Life

Students learn about natural selection and then complete a laboratory. After lessons on the genetic basis of and evidence for evolution, they complete a laboratory on population genetics. Students learn about applications of mathematics, including the Hardy-Weinberg Equilibrium and graphing, and review test-taking strategies for free-response questions.

- Course Introduction
- Natural Selection
- Phenotypic Variation in Populations
- Types of Natural Selection
- Laboratory: Natural Selection
- Application of Mathematics: Graphing
- Genetic Basis of Evolution
- Application of Mathematics: Hardy-Weinberg Equilibrium
- Vertical and Lateral Gene Transfer
- Laboratory: Population Genetics
- Origin of Life on Earth
- Evidence for Evolution
- Test-Taking Strategies
- Shared Ancestry: Conserved Traits
- Phylogeny and the Interrelatedness of Life
- Speciation and Extinction

Unit 2: Energy and the Processes of Life

Students learn about energy and life, photosynthesis, water and macronutrients, cellular respiration, and cell death. They complete labs on photosynthesis and cellular respiration, and review more test-taking strategies for multiple-choice questions.

- Energy and Life
- Energy Strategies of Living Things
- Photosynthesis
- Laboratory: Photosynthesis
- Glycolysis and Fermentation
- Test-Taking Strategies
- Cellular Respiration
- Laboratory: Cellular Respiration
- ATP
- Water and Macronutrients
- Cell Death

Unit 3: Homeostasis

Students learn about homeostasis, cell membranes and walls, positive and negative feedback, and behavioral responses. They learn about nutrients, respiration and circulation, temperature, and the immune response. They conduct labs on diffusion, osmosis and transpiration, and circulation, and learn to apply mathematics through data tables.

- Homeostasis
- Cell Membranes and Walls
- Passive and Active Transport
- Laboratory: Diffusion and Osmosis
- Exocytosis and Endocytosis
- Membranes and Organelles
- Application of Mathematics: Data Tables
- Positive and Negative Feedback Mechanisms
- Behavioral Responses to the Environment
- Biotic and Abiotic Factors
- Laboratory: Transpiration
- Obtaining and Eliminating Nutrients
- Regulating Respiration and Circulation
- Laboratory: Circulation
- Regulating Temperature
- Defense and the Immune Response
- Timing and Coordination of Life Processes

Unit 4: Genetics

Students learn about genes, DNA and RNA, protein synthesis, and genetic code. They study mitosis and meiosis, sexual and asexual reproduction, human genetic disorders, and ethical issues in genetics. They conduct labs in genetics and mitosis and meiosis, continue their practice of free-response strategies, and learn about applications of probability.

- History of the Gene
- DNA and RNA
- Protein Synthesis
- Test-Taking Strategies
- Genetic Code and Unity of Life
- Genetic Engineering
- Mitosis and Meiosis
- Laboratory: Mitosis and Meiosis
- Sexual Reproduction
- Asexual Reproduction
- Mendelian Inheritance
- Laboratory: Genetics
- Application of Mathematics: Probability
- Human Genetic Disorders
- Ethical Issues in Genetics

Unit 5: Semester 1 Review and Test

Students review the semester content and take an exam.

SEMESTER TWO

Unit 6: Regulation, Communication, and Signaling

Students learn about gene regulation in prokaryotes and eukaryotes; mutation, viruses, and genetic variation, and cell communication. They learn about processing signals and the nervous system structure and function. They conduct labs in gene regulation and behavior, and learn about the application of bioinformatics.

- Course Introduction
- Gene Regulation in Prokaryotes
- Gene Regulation in Eukaryotes
- Gene Regulation Signals
- Application of Mathematics: Bioinformatics
- Laboratory: Gene Regulation
- Mutation and Genetic Variation
- Viruses and Genetic Variation
- Test-taking Strategies
- Cell Communication
- Signal Transduction Pathways
- Information Exchange
- Laboratory: Behavior
- Processing Signals: Nervous System Structure
- Processing Signals: Nervous System Function
- Communication Between Individuals



Unit 7: Interaction of Biological Systems

Students learn about nucleic acids and proteins; lipids and carbohydrates; intercellular structure and function; and interactions between cells, organs, and systems. They learn about energy flow and changes in ecosystems, interactions between individuals and populations, molecular variation, and biodiversity. They conduct labs in molecular biology, dissolved oxygen, energy flow in ecosystems, and enzyme catalysis. They continue their review of test-taking strategies and learn about visualizing mathematical relationships.

- Nucleic Acids and Proteins
- Lipids and Carbohydrates
- Laboratory: Molecular Biology
- Test-taking Strategies
- Intercellular Structure and Function
- Laboratory: Dissolved Oxygen
- Interactions between Cells, Organs, and Systems
- Test-taking Strategies
- Interactions within Communities
- Energy Flow in Ecosystems
- Laboratory: Energy Flow in Ecosystems
- Application of Mathematics: Visualizing Mathematical Relationships
- Interactions of Molecules, Enzymes, and Cells
- Laboratory: Enzyme Catalysis
- Interactions between Individuals and Populations
- Changes in Ecosystems
- Molecular Variation
- Biodiversity

Unit 8: Semester 2 Review and Test

Students review the semester content and take an exam.

Unit 9: Comprehensive Review

Students do a comprehensive review of the entire course and complete a practice AP exam.

Unit 10: Independent Study

During the Independent Study portion of the course, teachers assign a project or reading to the students. Each teacher will choose an area of study in biology that allows students to explore, in depth, some aspect of biology that extends the course work.