



SYLLABUS

Welcome to the FlinnPREP™ AP* Biology Online Prep Course! Your enrollment in this course is your first step toward a 5 on the AP* Biology exam. FlinnPREP™ covers fundamental concepts in Biology using clear and concise text, vibrant images, practice examples, illustrative videos, engaging animations and end-of-unit summaries and assessments. All of the content can be viewed on a desktop, tablet or phone, so you can prepare for AP* Biology conveniently and on the go.

Unit 1 – Fundamental Biology Skills and Knowledge

- Matter
- Water Is Essential
- Cohesion and Adhesion
- Density of Water
- The Universal Solvent
- pH and Living Organisms
- Carbon
- Important Biological Functional Groups
- Root Words, Prefixes and Suffixes

Unit 2 – Cells: Structure and Function

- Prokaryotic and Eukaryotic Cells—Similarities and Differences
- Eukaryotic Organelles—A Detailed Look
- Cytoskeleton
- Cellular Membranes—Phospholipid Bilayer
- Cellular Membranes—Membrane Proteins
- Passive Transport
- Active Transport
- Exocytosis and Endocytosis
- Cellular Communication
- Neurons and Cell Signaling
- Relationship of Surface Area to Volume

Unit 3 – The Cell Cycle

- Cell Cycle Phases
- Chromosomes
- Mitotic Phase
- The Five Stages of Mitosis
- Prokaryotes and Cell Division Evolution
- Cell Cycle Control Systems
- The Loss of Cell Cycle Control
- Gene Expression and Cell Types

Unit 4 – Meiosis: Heredity and Variation

- Heredity
- Haploid and Diploid Cells
- Human Life Cycle
- Meiosis
- Phases of Meiosis
- Mitosis vs. Meiosis—Similarities and Differences
- Genetic Variation and Contribution to Evolution

Unit 5 – Mendelian and Molecular Genetics

- Inheritance
- Mendelian Genetics
- DNA Structure
- DNA Replication
- Mutations
- DNA Repair Mechanisms
- Gene to Protein
- Transcription
- Translation

Unit 6 – Evidence of Evolution

- The Geologic Timeline
- Absolute Radiometric Dating
- Relative Dating
- Fossil Record
- Anatomical Structures and Molecular Evidence
- Case Study—Deciphering Whale Evolution
- Life History
- Comparing Classical and Modern Classification
- Direct Observations of Evolution

Unit 7 – Evolution: Natural Selection

- Conditions for Natural Selection
- Genetic Variation
- Sources of Genetic Variation
- Overproduction of Offspring
- Struggle for Existence and Differential Survival and Reproduction
- Sexual Selection
- Artificial Selection

Unit 8 – Evolution: Populations

- Microevolution in Populations
- Hardy-Weinberg Equilibrium Conditions
- Hardy-Weinberg Equation
- Adaptive Evolution or Chance?
- Genetic Drift
- Changes in Allele Frequencies within a Generation
- Analyzing the Evolution of Multigene Traits
- Speciation
- Ecological Definition of a Species
- Case Study—Spotted Owls and Barred Owls

Unit 9 – Interdependence in Ecosystems

- Components of an Ecosystem
- Climate
- Abiotic Factors in Local Ecosystems
- Ecological Hierarchy
- Interactions Between Species
- Predation and Herbivory
- Symbiosis
- Competition
- Facilitation
- Ecosystem Stability and Disturbance
- Case Study—Fire in Western United States Pine Forests
- Population Dynamics
- Counting Populations to Determine Ecosystem Health

Unit 10 – Ecology: Energy Flow and Nutrient Cycling

- Elemental Components of Living Things
- Matter Moves in Cycles
- The Nitrogen Cycle
- The Carbon Cycle
- Photosynthesis: The Light Reactions
- Photosynthesis: The Calvin Cycle
- Respiration
- Energy Transfer between Trophic Levels
- Bioaccumulation and Biomagnification of Toxins
- Case Study—Orcas in Puget Sound and PCBs

Unit 11 – Biochemistry

- Types of Macromolecules
- Monomers and Polymers
- Carbohydrates
- Lipids
- Protein Structure
- Protein Function
- Enzyme Structure and Function
- Measuring and Predicting Enzyme Activity
- Case Study—Pepsin and Lipase in the Digestive System

Unit 12 – Energy and Metabolism

- Free Energy in Living Systems
- Endergonic and Exergonic Reactions
- Free Energy Utilization and Availability
- The First Law of Thermodynamics in Living Systems
- The Second Law of Thermodynamics
- The Role of ATP in Cells
- Introduction to Cellular Respiration
- Electron Carriers
- Glycolysis
- The Krebs Cycle
- Chemiosmosis, Electron Transport and Oxidative Phosphorylation
- Fermentation

Unit 13 – Organismal Regulation

- Homeostasis
- Negative Feedback
- Temperature Control and Evolution
- Positive Feedback Loop
- Neurons and Homeostasis
- Integration of Body Systems with the Nervous System and Endocrine System
- Osmoregulation
- Osmoregulation in Animals
- Osmoregulation in Plants

Unit 14 – Gene Regulation and Cell Communication

- Gene Regulation Overview
- Gene Regulation in Protein Synthesis
- Evidence of Evolution through Gene Regulation Mechanisms
- Discovering Prokaryotic Gene Regulation
- The lac Operon
- Repressible Operons
- Eukaryotic Gene Regulation Introduction
- Gene Regulation through Histone Modification
- Gene Regulation through Transcription Factors
- Gene Regulation through RNA Modification
- Regulation of Gene Expression through Phosphorylation of Proteins
- Summary of Regulation Pathways
- Summary of Eukaryotic Gene Expression
- Cell Communication in Multicellular Eukaryotes
- G-protein Coupled Receptors
- Receptor Tyrosine Kinases
- Case Study—Quorum Sensing in Bacteria

Unit 15 – The Immune Response

- Immune Responses of Plants
- Immune Responses in Animals
- Nonspecific Immune Responses
- Specific Immune Response in Vertebrates
- Specific Immune Response in Prokaryotes
- Biotechnology and Immunity
- Allergies and Immune System Malfunction
- Autoimmune Disease
- Case Study—Type 1 Diabetes

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FlinnPREP™ Online Student Prep Course for AP* Biology

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