

Curriculum at a Glance

Honors Biology

Level: 400

Grade 9

Honors biology is a full year, 9th-grade course exposing students to the great diversity that exists among organisms with an overview of topics ranging from one-celled organisms, plants, to the human being. First semester emphasizes the molecular biology of the cell. Second semester explores the systems approach of plants and animals.

Unit Name / Description	Essential Content and/or Skills
Introduction to Biology and Diversity and Variation	<ul style="list-style-type: none">● Influences that led Darwin to develop his theory of natural selection● The difference among facts, hypotheses and theories● Relate natural selection to the ongoing process of speciation● Using natural selection to understand the key concepts of the scientific method● Use examples to demonstrate the seven characteristics of life● The unity of life is based on DNA● Taxonomy and classification
Chemistry of Life	<ul style="list-style-type: none">● Introduction to elements, atoms, and compounds● Chemical bonds and the distribution of electrons● Inorganic chemistry and the emergent properties of water● Understanding the periodic table of elements

	<ul style="list-style-type: none"> ● Relate the characteristics and functions of carbohydrates, lipids, proteins, and nucleic acids ● Introduction to pH
Energy Transformations and Enzymes	<ul style="list-style-type: none"> ● Cells transform energy as they perform work ● Introduction to endergonic and exergonic reactions ● Trophic levels and energy pyramid ● Structure and functions of ATP ● Enzyme function in chemical reactions ● Enzyme inhibition and their role in regulation enzyme activity in the cell
Organization of Cells	<ul style="list-style-type: none"> ● Introduction to the cell ● Relate the similarities and differences between prokaryotic and eukaryotic cells ● Nucleus contains the cell's genetic information ● The role of DNA and protein production with respect to the ribosomes ● Form and function of the endomembrane system ● Differences among the energy-converting organelles ● Cell membrane and cytoskeleton regulating cell structure and homeostasis ● Cell transport, describe osmosis, passive and active transport
Photosynthesis	<ul style="list-style-type: none"> ● Introduction to photosynthesis ● The process of converting light energy into chemical energy ● Form and function of the chloroplast ● Sequencing the light reactions and the Calvin cycle

	<ul style="list-style-type: none"> ● Role of photosynthesis on the globe
Cellular Respiration	<ul style="list-style-type: none"> ● Introduction to cellular respiration ● Sequencing the stages of cellular respiration ● Differences between lactic acid and ethanol fermentation ● Connection between metabolic pathways
The Cell Cycle	<ul style="list-style-type: none"> ● Introduction to cell division and reproduction ● Prokaryotic cells and binary fission ● The eukaryotic cell cycle and the stages of mitosis ● The structure and function of DNA and DNA replication ● Role of enzymes during DNA replication ● The flow of genetic information from DNA to RNA to protein by transcription and translation ● Sequencing of steps for the chemical process of transcription and translation ● Discussion of mutations and how they affect genes ● Role of cyclins and regulation of the cell cycle
Reproduction	<ul style="list-style-type: none"> ● Sequencing the stages of meiosis ● Errors in meiosis, nondisjunction ● Explore the sources of variation, crossing over, independent assortment and random fertilization ● Differences between asexual and sexual reproductions, noting advantages and disadvantages

	<ul style="list-style-type: none"> ● Moss anatomy and alterations of generations ● Flower anatomy and reproduction ● Human anatomy
Patterns of Inheritance	<ul style="list-style-type: none"> ● Mendel's laws and variations within the laws ● Use of Punnett squares to determine the potential genotypes of offsprings from a parental mating ● Use of pedigrees to trace family lineage ● Role of karyotypes and chromosomal inheritance ● Sex-linked inheritance ● Role of Barr bodies during embryo development ● Crossing over and linked genes
Development of Plants and Animals	<ul style="list-style-type: none"> ● Plant structure and function ● Plant growth and hormones ● Plant responses to tropisms ● Principles of embryonic and human development
Population Genetics	<ul style="list-style-type: none"> ● The evolution of populations ● Explore the mechanisms of microevolution and macroevolution ● Natural selection, genetic drift, mutations, and gene flow cause microevolution ● Application of the Hardy-Weinberg principle can test whether a population is evolving ● Understanding the phylogeny and the evolution of life
Digestion and Nutrition	<ul style="list-style-type: none"> ● Describing the process of ingestion, digestion, absorption, and elimination

	<ul style="list-style-type: none"> ● Comparison of herbivores, omnivores and carnivores ● One-way versus two-way digestive tracts ● The human digestive system ● Discussion of animal nutrition and the importance of proper diet
Transport in Plants and Animals	<ul style="list-style-type: none"> ● The uptake and transport of plant nutrients and water ● Evolution of circulatory systems ● Comparison of open and closed systems ● The human circulatory system, including the parts of the human heart ● Structure and function of blood vessels ● Structure and function of blood
Gas Exchange and Excretion	<ul style="list-style-type: none"> ● Exploring the mechanisms of gas exchange, including gills, skin, and the tracheal system ● Importance of exchanging oxygen and carbon dioxide across moist body surfaces ● The human respiratory system ● Transport of gases in the human body system ● Understand how animals regulate homeostasis by balancing osmoregulation ● Role of excretory organs in osmoregulation ● Comparison of excretory organs in the diversity of animals
Nerves, Muscles, and Bones	<ul style="list-style-type: none"> ● Overview of nervous system structure and function diversity in animals ● Form and function of neurons ● Central and peripheral nervous systems

	<ul style="list-style-type: none"> ● Role of the human brain ● Movement and locomotion ● Importance of the vertebrate skeleton ● Muscle contraction and role of contractile filaments
Endocrine System	<ul style="list-style-type: none"> ● Chemical and electrical signals help regulate body functions ● Role of major endocrine glands/organs ● Role of hormones on hemostasis
Ecosystems	<ul style="list-style-type: none"> ● Ecosystem structure ● Energy flow and chemical cycling ● Ecosystem interactions (mutualism, competition, commensalism, and parasitism) ● Primary versus net product of energy ● Population dynamics and pyramid analysis
Behavioral Adaptations	<ul style="list-style-type: none"> ● Study of behavior ● Learning: habituation and imprinting ● Role of problem solving, associating a stimulus or behavior with a response