

## Curriculum at a Glance

### **AP Biology**

Level: 400

Grades 11 or 12

The AP Biology course is designed to offer students an opportunity to experience a college-level course that keeps pace with modern developments in Biology. The course is structured around four big ideas (the process of evolution drives the diversity and unity of life; biological systems utilize free energy and molecular building blocks to grow, reproduce and to maintain dynamic homeostasis; living systems store, retrieve, transmit and respond to information essential to life processes; and biological systems and their interactions possess complex properties) which encourage enduring understanding and reflect current scientific practices. Science is a process of understanding natural phenomena in terms of human understanding; this process is a result of inquiry. Consequently the course has a strong emphasis on inquiry to aid students in their development of critical thinking skills.

<b>Unit Name</b>	<b>Content</b>
Introduction	<ul style="list-style-type: none"><li>• Major themes of biology</li><li>• Darwin and the Theory of Natural Selection</li><li>• Inquiry as a scientific practice</li><li>• Communicating one's findings using written and graphic formats</li></ul>
Inorganic Chemistry and Biochemistry	<ul style="list-style-type: none"><li>• A variety of compounds can be developed from carbon</li><li>• Classification patterns of carbon compounds are based on their functional groups</li><li>• The four major classes of biological macromolecules and the roles of each in living organisms</li><li>• Interactions among molecules affect their structure and function</li><li>• The influence of pH and temperature on the structure of macromolecules</li><li>• Emergent properties of water</li></ul>
Cells and Membranes	<ul style="list-style-type: none"><li>• The development of the cell theory</li><li>• Comparisons of prokaryotic and eukaryotic cells in terms of size, structure, and modes of reproduction</li><li>• Comparisons of the form and function of plant and animal cellular organelles</li></ul>

	<ul style="list-style-type: none"> <li>● The form and function of the cellular cytoskeleton</li> <li>● The form and function of the various intercellular junctions used by plant and animal cells to form functional tissue</li> <li>● The form and function of the plasma membrane</li> <li>● Comparison of hypo-osmotic, hyperosmotic, and iso-osmotic solutions</li> <li>● Active and passive transport</li> <li>● The role of signals, receptors, transducers in cell communication</li> <li>● Examination of characteristics of cells which provide evidence of a common origin</li> </ul>
<p>Energy Transformations</p>	<ul style="list-style-type: none"> <li>● The role of redox reactions in anabolic and catabolic pathways</li> <li>● The structure and function of mitochondria and chloroplasts</li> <li>● The major stages and outcomes of cellular respiration and photosynthesis</li> <li>● Comparison of the processes and roles of cellular respiration and fermentation</li> <li>● How feedback mechanisms control cellular respiration and photosynthesis</li> <li>● The roles of photosynthesis and respiration in ecosystems as well as their impact on global warming</li> <li>● The laws of thermodynamics, the process of energy conversions and the role of ATP in cells</li> <li>● Activity of enzymes and their regulation of metabolism</li> </ul>
<p>Cell Reproduction and Genetic Basis of Life</p>	<ul style="list-style-type: none"> <li>● The structure of the nucleus of a cell and how the DNA is packaged within the nucleus</li> <li>● The form and function of a eukaryotic chromosome</li> <li>● Evolution of mitosis and development of meiosis</li> <li>● The complete cell cycle of plant and animal cells</li> <li>● Control of the cell cycle and how problems in the cell cycle can result in cancer; describe how cancer spreads through the body during metastasis</li> <li>● Genes are passed from parent to offspring by the inheritance of chromosomes</li> <li>● The key events of meiosis and its significance for sexual reproduction</li> <li>● The process of crossing-over and how it contributes to genetic diversity and evolution</li> <li>● Genes are located on chromosomes (concepts of gene linkage, mapping distance between genes and causes of genetic disorders)</li> <li>● The difference between sex chromosomes and autosomes, and predicting</li> </ul>

	<p>the sex of an individual based on a karyotype</p> <ul style="list-style-type: none"> <li>● Errors that can occur during meiosis and the consequences of those errors for an individual and a species</li> <li>● Concepts of Mendel’s principles of inheritance and their exceptions</li> <li>● The principles of independent assortment and segregation using the rules of probability</li> </ul>
<p>Molecular Genetics and Biotechnology</p>	<ul style="list-style-type: none"> <li>● The development of the scientific research involved in the search for DNA as the genetic material of life</li> <li>● The process of DNA replication</li> <li>● The development and implications of the “one gene, one protein” hypothesis</li> <li>● The processes of transcription and RNA formation</li> <li>● The process of translation</li> <li>● The causes and value of genetic mutations and their effect on proteins</li> <li>● Viral structure and activity</li> <li>● The methods involved in the transfer and recombination of bacterial genes</li> <li>● The processes of regulation and gene expression in prokaryotic and eukaryotic cells</li> <li>● DNA technology and its applications</li> </ul>
<p>Mechanisms of Evolution</p>	<ul style="list-style-type: none"> <li>● The conditions of the earth and its atmosphere at its earliest beginnings</li> <li>● How natural selection serves as a mechanism for evolution</li> <li>● Punctuated equilibrium and other modern concepts of evolution</li> <li>● The scientific evidence for evolution</li> <li>● The Hardy-Weinberg Theorem</li> <li>● How allele frequencies in a population may change over time</li> <li>● Concept of a species</li> <li>● The reproductive barriers that affect speciation</li> <li>● Current techniques of systematics employed in understanding evolution</li> </ul>
<p>Diversity in the World: Organism Form and Function</p>	<ul style="list-style-type: none"> <li>● The major tissues of the seed plants and an understanding of their relationships</li> <li>● The outcome of plant growth based on data given from experiments using plant hormones</li> <li>● The processes of water and food movement in plants</li> <li>● Plant responses to environmental stimuli</li> <li>● Evolutionary trends in plants and animals</li> </ul>

	<ul style="list-style-type: none"> <li>● Thermoregulation in animals</li> <li>● The mechanisms of homeostasis during moderate changes in internal environments and how they are regulated by feedback circuits</li> <li>● The main components, functions, and interdependency of the major organ systems of animals</li> <li>● Structure and function of the immune system</li> <li>● How sensory systems receive and transduce stimulus energy</li> <li>● Structure and function of the human brain</li> </ul>
<p style="text-align: center;">Animal Behavior and Ecology</p>	<ul style="list-style-type: none"> <li>● The roles of genetics and environment in animal behavior</li> <li>● The processes of learning and behavior modification</li> <li>● The role of evolutionary theory in Behavioral Ecology and Sociobiology</li> <li>● The relationships between biotic and abiotic factors</li> <li>● The various aquatic biomes as to their dependence on light, pH, temperature, and community structure</li> <li>● Population dynamics and the factors that regulate population growth</li> <li>● Analysis of biological succession</li> <li>● The hierarchy of an ecosystem as related to its biotic organization and abiotic factors</li> <li>● The relationships of the nutrient cycles in relation to living organisms in an ecosystem</li> <li>● The biodiversity crisis, its levels, major threats, conservation, and impact on human welfare</li> <li>● The effects of introducing a non-native species into an ecosystem</li> </ul>