Franklin Public Schools

Biology
College Preparatory
Grades 9, 10, 11 or 12

Biology CP provides students with an introduction to the various ideas key to the understanding of modern Biology, Basic Chemistry, The Cell, Genetics, Evolution, and Ecology. Students are continually encouraged to demonstrate their understanding of biologic concepts through self-directed investigations, topic presentations, and laboratory experiments.

1. The Chemistry of Life

Broad Concept: Living things are made of atoms bonded together to form organic molecules.

1.1 Explain the significance of carbon in organic molecules.
1.2 Recognize the 6 most common elements in organic molecules (C, H, N. O, P, S).
1.3 Describe the composition and functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).
1.4 Describe how dehydration synthesis and hydrolysis relate to organic molecules.
1.5 Explain the role of enzymes in biochemical reactions.

2. Structure and Function of Cells

Broad Concept: All living things are composed of cells. Life processes in a cell are based on molecular interactions.

2.1 Relate cell parts/organelles to their functions.
2.2 Differentiate between prokaryotic cells and eukaryotic cells, in terms of their general structures and degrees of complexity.
2.3 Distinguish between plant and animal cells.
2.4 Explain the role of cell membranes (diffusion, osmosis, and active transport).
2.5 Identify the reactants and products in the general reaction of photosynthesis.
2.6 Provide evidence that the organic compounds produced by plants are the primary source of energy and nutrients for most living things.
2.7 Identify that cellular respiration produces ATP.
2.8 Explain the interrelated nature of photosynthesis and cellular respiration.
2.9 Describe the processes of mitosis, meiosis, and the cell cycle and their significance.

3. Genetics

Broad Concept: Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.

3.1 Describe the structure and function of DNA and distinguish between replication, transcription, and translation.
3.2 Describe the general pathway by which ribosomes produce proteins by using tRNAs to translate genetic information encoded in mRNAs.
3.3 Explain how mutations in the DNA sequence of a gene may result in phenotypic change in an organism and its offspring.
3.4 Differentiate between dominant, recessive, codominant, polygenic, and sex-linked traits.
3.5 State Mendel's law of segregation and independent assortment.
3.6 Use a Punnett Square to determine the genotype and phenotype of monohybrid crosses.
3.7 Explain how zygotes are produced in the fertilization process.

4. Evolution and Biodiversity

Broad Concept: Evolution and biodiversity are the result of genetic changes that occur in constantly changing environments.

4.1 Explain how the fossil record and other evidence support the theory of evolution.
4.2 Illustrate how genetic variation is preserved or eliminated from a population through Darwinian natural selection resulting in biodiversity.
4.3 Describe how the taxonomic system classifies living things into domains and kingdoms.

5. Ecology

Broad Concept: Ecology is the interaction between living organisms and their environment.

5.1 Explain how biotic and abiotic factors cycle in an ecosystem (water, carbon, oxygen, and nitrogen).
5.2 Use a food web to identify and distinguish producers, consumers, and decomposers and explain the transfer of energy through trophic levels.
5.3 Identify the factors in an ecosystem that influence fluctuations in population size.
5.4 Explain how symbiotic behavior produces interactions within ecosystems.