

Franklin Public Schools**Biology
Honors
Grades 9, 10,11 or 12**

Biochemistry, Cell Biology, Molecular and Mendelian Genetics, Classification, Evolution and the Origin of Species Diversity, and Ecology comprise the main topics of Biology Honors. Four student-generated projects will be carried out during the year. All students are required to produce a project and participate in the science fair. Success in Honors Biology is highly dependent on strong language ability.

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.