

Biology Honors

5 credits - Level: Honors (This course fulfills the biology requirement for graduation.)

Grades: 9-12

Prerequisite: Minimum grade of A, with no more than one B, in all four marking periods in 8th grade science, score advanced proficient on both the science and the language arts literacy sections of the NJ ASK 8.

This laboratory course requires students to employ previously and newly learned scientific and problem-solving skills along with appropriate technology to a study of living things. The scope of this course ranges from an in-depth examination of the basic biological unit, the cell, through the most complex processes of complex plants and animals.

PROFICIENCIES

HABITS OF MIND

- correctly use instruments, apparatus and technologies of biology (such as the microscope) and demonstrate the procedures of biology (preparation of wet mount slides, use of laboratory materials and protective equipment) in a safe, prescribed manner.
- identify ways in which the study of biology serves as a foundation for many career opportunities in science and technology.
- defend the need to care for, respect and protect living things and their habitats.
- utilize the scientific method in solving biological problems and use mathematical operations, where appropriate, for solving those problems.
- evaluate information about current biological issues.

CELLULAR BIOLOGY CONCEPTS

- explain the meaning of the cell theory.
- compare and contrast the role of carbohydrates, proteins, fats and nucleic acids in the functioning of a cell.
- develop or construct one of the following models to illustrate the processes of diffusion, osmosis and active transport: paper and pencil, three-dimensional, experimental or computer.
- describe the relationships between cell structure and function of the following cellular parts: nucleus, cell membrane, mitochondrion, chloroplast, ribosomes and endoplasmic reticulum.
- describe the characteristics and functions of enzymes and the factors that affect their actions.
- explain the importance of cell specialization and its relationship to differentiation and division of labor.
- list the raw materials, end products and relative energy yield of aerobic and anaerobic respiration.
- compare similarities and differences between photosynthesis and respiration and analyze these processes in terms of energy exchanges in living systems.

TAXONOMY/DIVERSITY/SYSTEMATICS

- explain the reasons for classifying organisms into groups and describe the criteria and methods used by scientists to establish and continue to modify these groups.
- name the five kingdoms and identify the major characteristics of each.
- use a simple taxonomic key to identify selected organisms.

GENETICS

- explain Mendel's contribution to our understanding of heredity.
- define the term "gene" and be able to give a general explanation of how genes are able to control cellular activities.
- account for the distribution of genes and chromosomes from one generation to the next based on the results of mitosis and meiosis.
- determine similarities and differences between the genetic principles of dominance, incomplete dominance, sex determination, sex-linked inheritance and mutation.
- discuss the characteristics and causes of the following genetic disorders: Down's Syndrome, sickle cell anemia, cystic fibrosis and Tay-Sachs disease.

EVOLUTION

- explain a biological hypothesis for the origin of life.
- describe and evaluate evidence that supports the theory of evolution.
- explain Darwin's theory of evolution through natural selection and how it was developed.
- explain how the diversity of life is thought to have resulted from evolution over time.

HUMAN BIOLOGY

- identify the major systems of the human body and explain the major functions of each system.

ECOLOGY

- evaluate the effects of humans on the state of the biosphere with respect to the current biological problems pertaining to air, water and land (solid waste, ozone, greenhouse effect, acid rain, hazardous/toxic water, sewage, human population density, habitat loss, species extinction and recycling).
- describe the carbon and water cycles and explain their importance to all living things.
- organize and make use of the criteria, both biotic and abiotic, that ecologists use to describe biomes.
- explain how populations change as a result of migration, distribution, growth and competition for limited resources.
- describe how succession may result in a climax community and predict the impact of natural phenomena and humans on this process.
- develop a food web and relate how it is affected by the flow of energy and matter.