

## High School:

### Structure and Functions of Living Organisms

**NCES.Bio.1.1** - Understand the relationship between the structures and functions of cells and their organelles.

**NCES.Bio.1.1.1** - Summarize the structure and function of organelles in eukaryotic cells (including: the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell.

**NCES.Bio.1.1.2** - Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.

**NCES.Bio.1.1.3** - Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.

**NCES.Bio.1.2** - Analyze the cell as a living system.

**NCES.Bio.1.2.1** - Explain how homeostasis is maintained in the cell and within an organism in various environments (including: temperature and pH).

**NCES.Bio.1.2.2** - Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.

**NCES.Bio.1.2.3** - Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).

### Ecosystems

**NCES.Bio.2.1** - Analyze the interdependence of living organisms within their environments.

**NCES.Bio.2.1.1** - Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem.

**NCES.Bio.2.1.2** - Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.

**NCES.Bio.2.1.3** - Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.

**NCES.Bio.2.1.4** - Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease).

**NCES.Bio.2.2** - Understand the impact of human activities on the environment (one generation affects the next).

**NCES.Bio.2.2.1** - Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment.

**NCES.Bio.2.2.2** - Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.

## Evolution and Genetics

**NCES.Bio.3.1** - Explain how traits are determined by the structure and function of DNA.

**NCES.Bio.3.1.1** - Explain the double-stranded, complementary nature of DNA as related to its function in the cell.

**NCES.Bio.3.1.2** - Explain how DNA and RNA code for proteins and determine traits.

**NCES.Bio.3.1.3** - Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype.

**NCES.Bio.3.2** - Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.

**NCES.Bio.3.2.1** - Explain the role of meiosis in sexual reproduction and genetic variation.

**NCES.Bio.3.2.2** - Predict offspring ratios based on a variety of inheritance patterns (including: dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits).

**NCES.Bio.3.2.3** - Explain how the environment can influence the expression of genetic traits.

**NCES.Bio.3.3** - Understand the application of DNA technology.

**NCES.Bio.3.3.1** - Interpret how DNA is used for comparison and identification of organisms.

**NCES.Bio.3.3.2** - Summarize how transgenic organisms are engineered to benefit society.

**NCES.Bio.3.3.3** - Evaluate some of the ethical issues surrounding the use of DNA technology (including: cloning, genetically modified organisms, stem cell research, and Human Genome Project).

**NCES.Bio.3.4** - Explain the theory of evolution by natural selection as a mechanism for how species change over time.

**NCES.Bio.3.4.1** - Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.

**NCES.Bio.3.4.2** - Explain how natural selection influences the changes in species over time.

**NCES.Bio.3.4.3** - Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.

**NCES.Bio.3.5** - Analyze how classification systems are developed based upon speciation.

**NCES.Bio.3.5.1** - Explain the historical development and changing nature of classification systems.

**NCES.Bio.3.5.2** - Analyze the classification of organisms according to their evolutionary relationships (including: dichotomous keys and phylogenetic trees).

## Molecular Biology

**NCES.Bio.4.1** - Understand how biological molecules are essential to the survival of living organisms.

**NCES.Bio.4.1.1** - Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.

**NCES.Bio.4.1.2** - Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.

**NCES.Bio.4.1.3** - Explain how enzymes act as catalysts for biological reactions.

**NCES.Bio.4.2** - Analyze the relationships between biochemical processes and energy use in the cell.



# North Carolina Essential Standards Biology

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**NCES.Bio.4.2.1** - Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.

**NCES.Bio.4.2.2** - Explain ways that organisms use released energy for maintaining homeostasis (active transport).