

NORTH CAROLINA ESSENTIAL STANDARDS

Occupational Course of Study Biology

Note: All students following the Occupational Course of Study are also required to take [English I, II, III, and IV](#), [Math I](#), [American History I](#) and [American History II](#), and [Health](#) and [Physical Education](#).

Grade: High School

Course: Structure and Functions of Living Organisms

- **OBio.1.1** - Understand the relationship between the structures and functions of cells and their organelles.
 - **OBio.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.
 - **OBio.1.1.2** - Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.
 - **OBio.1.1.3** - Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.
- **OBio.1.2** - Analyze the cell as a living system.
 - **OBio.1.2.1** - Explain how homeostasis is maintained in the cell and within an organism in various environments (including: temperature and pH).
 - **OBio.1.2.2** - Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.
 - **OBio.1.2.3** - Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).

Course: Ecosystems

- **OBio.2.1** - Analyze the interdependence of living organisms within their environments.
 - **OBio.2.1.1** - Compare 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.
 - **OBio.2.1.2** - Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.
 - **OBio.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.
 - **OBio.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).
- **OBio.2.2** - Understand the impact of human activities on the environment (one generation affects the next).
 - **OBio.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.
 - **OBio.2.2.2** - Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.



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Course: Evolution & Genetics

- **OBio.3.1** - Explain how traits are determined by the structure and function of DNA.
 - **OBio.3.1.1** - Explain the double-stranded, complementary nature of DNA as related to its function in the cell.
 - **OBio.3.1.2** - Explain how DNA and RNA code for proteins and determine traits.
 - **OBio.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.
- **OBio.3.2** - Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.
 - **OBio.3.2.1** - Explain the role of meiosis in sexual reproduction and genetic variation.
 - **OBio.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).
 - **OBio.3.2.3** - Explain how the environment can influence the expression of genetic traits.
- **OBio.3.3** - Understand the application of DNA technology.
 - **OBio.3.3.1** - Interpret how DNA is used for comparison and identification of organisms.
 - **OBio.3.3.2** - Summarize how transgenic organisms are engineered to benefit society.
 - **OBio.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).
- **OBio.3.4** - Explain the theory of evolution by natural selection as a mechanism for how species change over time.
 - **OBio.3.4.1** - Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.
 - **OBio.3.4.2** - Explain how natural selection influences the changes in species over time.
 - **OBio.3.4.3** - Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.
- **OBio.3.5** - Understand how classification systems are developed based upon speciation.
 - **OBio.3.5.1** - Explain the historical development and changing nature of classification systems.
 - **OBio.3.5.2** - Analyze the classification of organisms according to their evolutionary relationships (including: dichotomous keys and phylogenetic trees).

Course: Molecular Biology

- **OBio.4.1** - Understand how biological molecules are essential to the survival of living organisms.
 - **OBio.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.
 - **OBio.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.
 - **OBio.4.1.3** - Explain how enzymes act as catalysts for biological reactions.
- **OBio.4.2** - Analyze the relationships between biochemical processes and energy use.
 - **OBio.4.2.1** - Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.



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- **OBio.4.2.2** - Summarize ways that organisms use released energy for maintaining homeostasis (active transport).

