

# Cumberland County Schools Curriculum Guide Biology



**High School Level**

# BIOLOGY

Science, by nature, is an inquiry-based discipline whereby students gain knowledge through observation and experimentation. Scientific investigations involve collection of relevant evidence, use of logical reasoning, application of imagination to devise hypotheses, and explanations to make sense of collected evidence. The process skills of scientific inquiry support development of reasoning and problem-solving ability and are the core of scientific methodologies.

The high school Biology curriculum encompasses the following four strands: Structure and Functions of Living Organisms, Ecosystems, Evolution and Genetics, and Molecular Biology. Students begin with an introduction to science and the process of scientific inquiry. In the Structure and Functions of Living Organisms strand, students will study living systems at all levels of organization and will understand the complementary nature of structure and function. Study of the Ecosystems strand will provide analysis of the interdependence of living organisms and how humans impact the environment. In the study of the Evolution and Genetics strand, students will develop an understanding of how genetic traits are determined, how environmental factors can affect those traits, and how evolution by natural selection is a mechanism for change within species over time. In the Molecular Biology strand, students will develop an understanding of biological molecules, enzymes, and biochemical processes. By the end of the year, students will have developed a depth of understanding of biological processes that will prepare them for further study at the college level.

## Structure and Functions of Living Organisms

### Understand the relationship between the structures and functions of cells and their organelles.

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.
2. Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.
3. Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.

### Analyze the cell as a living system.

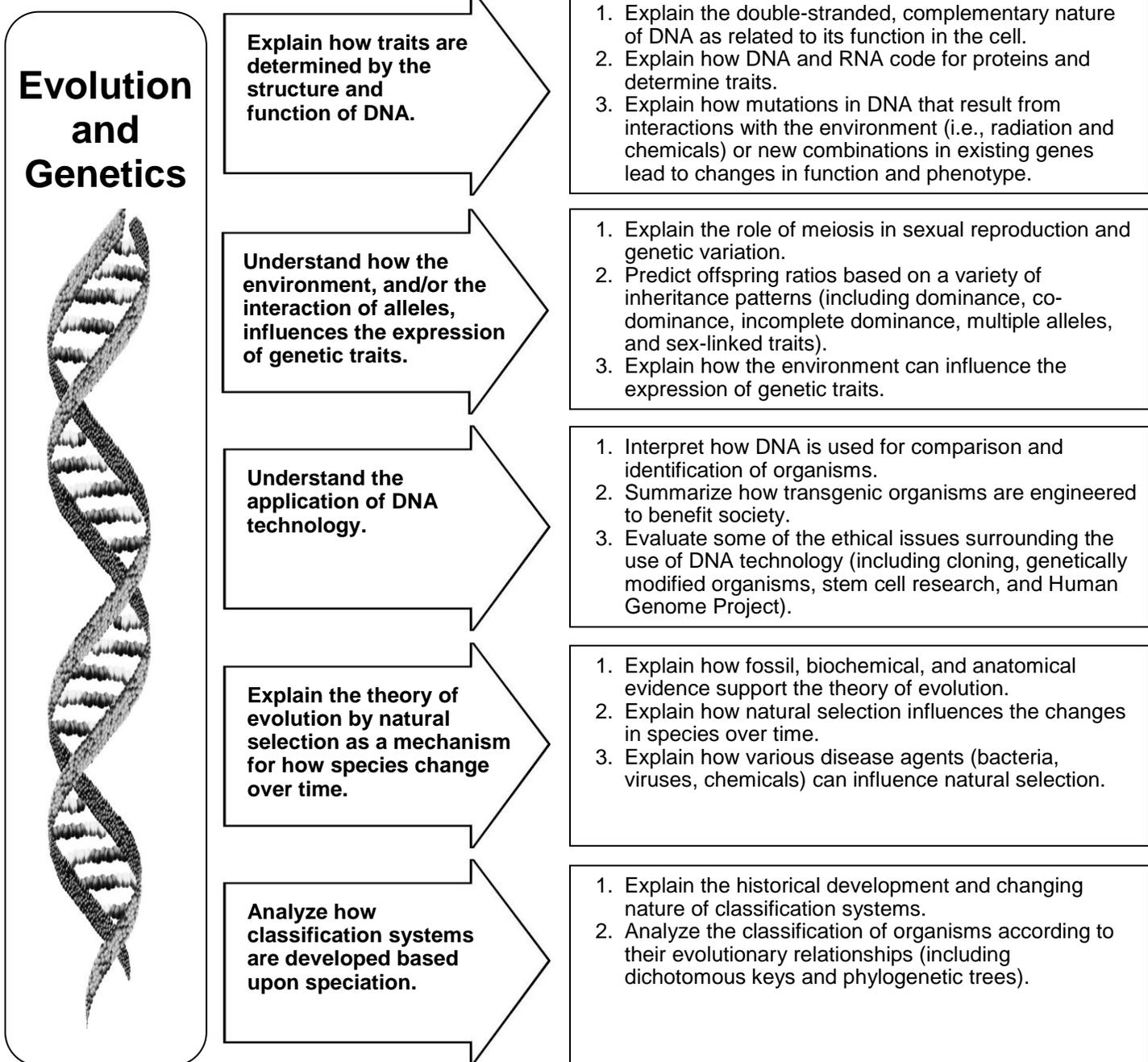
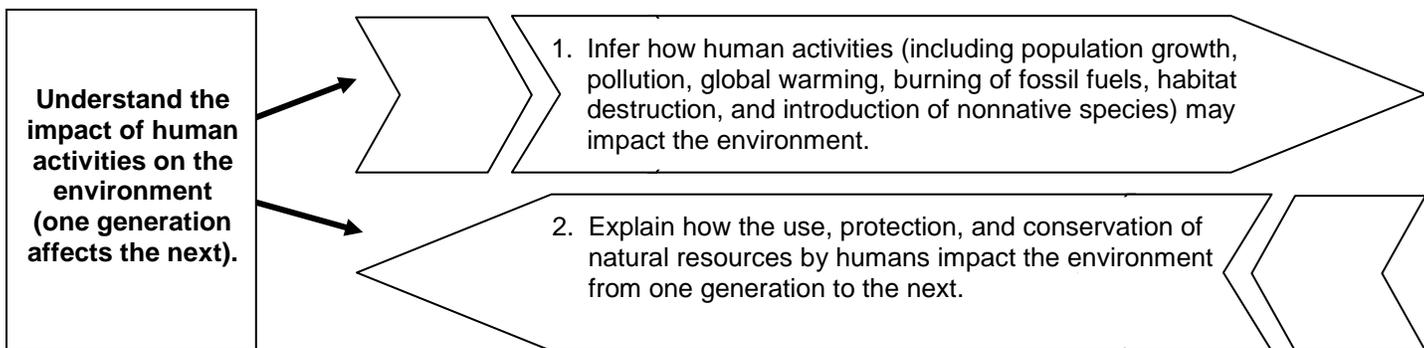
1. Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH).
2. Analyze how cells grow and reproduce in terms of interphase, mitosis, and cytokinesis.
3. Explain how specific cell adaptations help cells survive in particular environments.

## Ecosystems

### Analyze the interdependence of living organisms within their environments.

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.
2. Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.
3. Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments, resulting in stability within ecosystems.
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).

## Ecosystems (Continued)



# Molecular Biology

Analyze the relationships between biochemical processes and energy use in the cell.

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.

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.

3. Explain how enzymes act as catalysts for biological reactions.

Understand how biological molecules are essential to the survival of living organisms.

1. Explain ways that organisms use released energy for maintaining homeostasis (active transport).

2. Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.