North Carolina Science

Biology

From Molecules to Organisms- Structures and Processes

1 **Analyze how the relationship between structure and function supports life processes within organisms.** LS.BIO.1

1 Construct an explanation to illustrate relationships between structure and function of major macromolecules essential for life. LS.BIO.1.1

2 Carry out investigations to illustrate how enzymes act as catalysts for biochemical reactions and how environmental factors affect enzyme activity. LS.BIO.1.2

3 Use models to explain how the structure of organelles determines its function and supports overall cell processes. LS.BIO.1.3

4 Construct explanations to compare prokaryotic and eukaryotic cells in terms of structures and degree of complexity. LS.BIO.1.4

5 Construct an explanation to summarize how DNA and RNA direct the synthesis of proteins. LS.BIO.1.5

2 **Analyze the growth and development processes of organisms.** LS.BIO.2

1 Use models to illustrate how cellular division results in the reproduction, growth, and repair of organisms. LS.BIO.2.1

2 Construct an explanation to illustrate that proteins regulate gene expression resulting in cellular differentiation, specialized cells with specific functions, and uncontrolled cell growth. LS.BIO.2.2

3 **Analyze the relationship between biochemical processes and energy use.** LS.BIO.3

1 Carry out investigations to explain how homeostasis is maintained through feedback mechanisms. LS.BIO.3.1

2 Use models to illustrate how photosynthesis transforms light energy into chemical energy. LS.BIO.3.2

3 Use models to illustrate how cellular respiration [aerobic and anaerobic] transforms chemical energy into ATP. LS.BIO.3.3

Ecosystems- Interactions, Energy, and Dynamics

1 **Analyze the relationships between matter and energy within ecosystems.** LS.BIO.4

1 Use models to illustrate how processes in organisms contribute to the flow of energy and the cycling of matter within an ecosystem. LS.BIO.4.1

2 Use models to explain the relationship between the flow of energy and cycling of matter among organisms in an ecosystem. LS.BIO.4.2

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2 **Understand ecosystem dynamics, functioning, and resilience.** LS.BIO.5

1 Use mathematics and computational thinking to explain how interactions between organisms (predator/prey, competition) affect carrying capacity and maintain stability in an ecosystem. LS.BIO.5.1

2 Engage in argument from evidence to evaluate various solutions to reduce the impact of human activities on biodiversity and ecosystem health. LS.BIO.5.2

Heredity- Inheritance and Variation of Traits

1 **Understand genetic mechanisms for variation.** LS.BIO.6

1 Use models to explain how DNA is passed from parents to offspring through the processes of meiosis and fertilization in sexual reproduction. LS.BIO.6.1

2 Construct an explanation to summarize how inheritable genetic variations may result from: new genetic combinations in meiosis,mutations during replication, or mutations caused by environmental factors. LS.BIO.6.2

2 **Understand types of inheritance and how the environment can influence traits.** LS.BIO.7

1 Use mathematics and computational thinking to predict the variation and distribution of expressed traits based on: Mendelian inheritance, co-dominance, incomplete dominance, multiple alleles, and sex-linked inheritance. LS.BIO.7.1

2 Analyze and interpret data to explain how polygenic traits result in a wide range of phenotypes. LS.BIO.7.2

3 Construct an explanation to summarize how traits result from interactions of genetic factors (multiple genes and/or alleles) and environmental factors. LS.BIO.7.3

3 **Understand applications of genetics and biotechnology.** LS.BIO.8

1 Analyze and interpret data to compare DNA samples. LS.BIO.8.1

2 Obtain and communicate information that summarizes the impact of biotechnology applications on the individual, society, and the environment, including agriculture and medicine. LS.BIO.8.2

Biological Evolution- Unity and Diversity

1 **Understand natural selection as a mechanism for biological evolution.** LS.BIO.9

1 Analyze and interpret data to summarize how various factors such as geographic isolation, pesticide resistance, antibiotic resistance can influence natural selection. LS.BIO.9.1

2 Construct an explanation to illustrate how common ancestry and biological evolution are supported by multiple lines of empirical evidence. LS.BIO.9.2

3 Use models to illustrate the conditions required for natural selection, including the overproduction of offspring, inherited variation, and the struggle to survive. LS.BIO.9.3

4 Construct an explanation to explain how natural selection leads to adaptations within populations. LS.BIO.9.4

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2 **Analyze evolutionary relationships among organisms.** LS.BIO.10

1 Construct explanations to illustrate how varying environmental conditions may result in: changes in the number of individuals of a species, the emergence of new species over time, or the extinction of other species. LS.BIO.10.1

2 Use models (including dichotomous keys, scientific nomenclature, cladograms, phylogenetic trees) to identify organisms and exemplify relationships. LS.BIO.10.2