

Norton City Schools Standards-Based Science Course of Study 2003

NINTH/TENTH GRADE

LIFE SCIENCE (USED A YEAR-LONG OR BLOCK-SCHEDULED COURSE)

Life Sciences Standard (LS)

9-10 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 9-10 program, the student will:</p> <p><u>Life Sciences</u></p> <ul style="list-style-type: none"> ★ Explain that cells are the basic unit of structure and function of living organisms that once life originated all cells come from pre-existing cells, and that there are a variety of cell types. (LS-A) ★ Explain the characteristics of life as indicated by cellular processes and describe the process of cell division and development. (LS-B) ★ Explain the genetic mechanisms and molecular basis of inheritance. (LS-C) ★ Explain the flow of energy and the cycling of matter through biological and ecological systems (cellular, organismal and ecological). (LS-D) ★ Explain how evolutionary relationships contribute to 	<p>By the end of Ninth/Tenth Grade, the student will:</p> <p><u>Characteristics and Structure of Life</u></p> <ul style="list-style-type: none"> ★ Explain that living cells <ul style="list-style-type: none"> a. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur) b. are the basic unit of structure and function of all living things c. come from pre-existing cells after life originated, and d. are different from viruses. (LS-10-1) ★ Compare the structure, function and interrelatedness of cell organelles in eukaryotic cells (e.g., nucleus, chromosome, mitochondria, cell membrane, cell wall, chloroplast, cilia, flagella) and prokaryotic cells. (LS-10-2) ★ Explain the characteristics of life as indicated by cellular processes including <ul style="list-style-type: none"> a. homeostasis b. energy transfers and transformation c. transportation of molecules d. disposal of wastes e. synthesis of new molecules (LS-10-3) ★ Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells. (LS-10-4) <p><u>Heredity</u></p> <ul style="list-style-type: none"> ★ Illustrate the relationship of the structure and function of DNA to 	

Note: Ohio Academic Content Standards, Benchmarks and Indicators, are typed in bold print and designated by a “★”.

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<p>an understanding of the unity and diversity of life. (LS-E)</p> <p>★ Explain the structure and function of ecosystems and relate how ecosystems change over time. (LS-F)</p> <p>★ Describe how human activities can impact the status of natural systems. (LS-G)</p> <p>★ Describe a foundation of biological evolution as the change in gene frequency of a population over time. Explain the historical and current scientific developments, mechanisms and processes of biological evolution. Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (LS-H)</p> <p>★ Explain how natural selection and other evolutionary mechanisms account for the unity and diversity of past and present life forms. (LS-I)</p> <p>★ Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences. (LS-J)</p>	<p>protein synthesis and the characteristics of an organism. (LS-10-5)</p> <p>★ Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short). (LS-10-6)</p> <p>★ Describe that spontaneous changes in DNA are mutations, which are a source of genetic variation. When mutations occur in sex cells, they may be passed on to future generations; mutations that occur in body cells may affect the functioning of that cell or the organism in which that cell is found. (LS-10-7)</p> <p>★ Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits and jumping genes) to explain inheritance. (LS-10-8)</p> <p><u>Diversity and Interdependence of Life</u></p> <p>★ Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids). (LS-10-9)</p> <p>★ Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation). (LS-10-10)</p> <p>★ Explain that living organisms use matter and energy to synthesize a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g., growth, reacting to the environment, reproduction and movement). (LS-10-11)</p> <p>★ Describe that biological classification represents how organisms are related with species being the most fundamental unit of the classification system. Relate how biologists arrange organisms into a hierarchy of groups and subgroups based on similarities and differences that reflect their evolutionary relationships. (LS-10-12)</p> <p>★ Explain that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under gradually changing environmental conditions. (LS-10-13)</p> <p>★ Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation). (LS-10-14)</p> <p>★ Explain how living things interact with biotic and abiotic components</p>	
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of the environment (e.g., predation, competition, natural disasters and weather). (LS-10-15)

- ★ **Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy. (LS-10-16)**
- ★ **Conclude that ecosystems tend to have cyclic fluctuations around a state of approximate equilibrium that can change when climate changes, when one or more new species appear as a result of immigration or when one or more species disappear. (LS-10-17)**
- ★ **Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes in technology/biotechnology can cause significant changes, either positive or negative, in environmental quality and carrying capacity. (LS-10-18)**
- ★ **Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production, sustainable vs. nonsustainable agriculture). (LS-10-19)**

Evolutionary Theory

- ★ **Recognize that a change in gene frequency (genetic composition) in a population over time is a foundation of biological evolution. (LS-10-20)**
- ★ **Explain that natural selection provides the following mechanism for evolution; undirected variation in inherited characteristics exist within every species. These characteristics may give individuals an advantage or disadvantage compared to others in surviving and reproducing. The advantaged offspring are more likely to survive and reproduce. Therefore, the proportion of individuals that have advantageous characteristics will increase. When an environment changes, the survival value of some inherited characteristics may change. (LS-10-21)**
- ★ **Describe historical scientific developments that occurred in evolutionary thought (e.g. Lamarck and Darwin, Mendelian Genetics and modern synthesis). (LS-10-22)**

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| | <ul style="list-style-type: none">★ Analyze how natural selection and other evolutionary mechanisms (e.g., genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms. (LS-10-24)★ Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved. (LS-10-25) <p><u>Historical Perspectives and Scientific Revolutions</u></p> <ul style="list-style-type: none">★ Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology and discovering germs). (LS-10-26)★ Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology and discovering germs). (LS-10-27)★ Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning). (LS-10-28) | |
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