

Norton City Schools Standards-Based Science Course of Study 2003

HIGH SCHOOL ELECTIVE

ZOOLOGY (USED AS A SEMESTER, YEAR-LONG OR BLOCK-SCHEDULED COURSE)

Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 11-12 program, the student will:</p> <p><u>Life Sciences</u></p> <ul style="list-style-type: none"> ★ Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-A) ★ Explain how humans are connected to and impact natural systems. (LS-B) ★ Explain how the molecular basis of life and the principles of genetics determine inheritance. (LS-C) ★ Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future. (LS-D) ★ Explain the interconnectedness of the components of a natural system. (LS-E) ★ Explain how human choices today will affect the quality and quantity of life on earth. (LS-F) 	<p>By the end of Eleventh/Twelfth Grades, the student will:</p> <p><u>Characteristics and Structure of Life</u></p> <ul style="list-style-type: none"> ★ Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) ★ Recognize that chemical bonds of food molecules contain energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Some of this energy is released as thermal energy. (LS-11-2) ★ Relate how birth rates, fertility rates and death rates are affected by various environmental factors. (LS-11-3) ★ Examine the contributing factors of human population growth that impact natural systems such as levels of education, children in the labor force, education and employment of women, infant mortality rates, costs of raising children, birth control methods, and cultural norms. (LS-11-4) ★ Investigate the impact on the structure and stability of ecosystems due to changes in their biotic and abiotic components as a result of human activity. (LS-11-5) ★ Recognize that information stored in DNA provides the instructions for assembling protein molecules used by the cells that determine the characteristics of the organism. (LS-12-1) ★ Explain why specialized cells/structures are useful to plants and animals (e.g., stoma, phloem, xylem, blood, nerve, muscle, egg and sperm). (LS-12-2) 	

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

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<p>* Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-G)</p>	<p>* Explain that the sun is essentially the primary source of energy for life. Plants capture energy by absorbing light and using it to form strong (covalent) chemical bonds between the atoms of carbon-containing (organic) molecules. (LS-12-3)</p> <p>* Explain that carbon-containing molecules can be used to assemble larger molecules with biological activity (including proteins, DNA, sugars and fats). In addition, the energy stored in bonds between the atoms (chemical energy) can be used as sources of energy for life processes. (LS-12-4)</p> <p><u>Heredity</u></p> <p>* Examine the inheritance of traits through one or more genes and how a single gene can influence more than one trait. (LS-12-5)</p> <p>* Explain how developmental differentiation is regulated through the expression of different genes. (LS-12-6)</p> <p><u>Diversity and Interdependence of Life</u></p> <p>* Predict some possible impacts on an ecosystem with the introduction of a non-native species. (LS-11-6)</p> <p>* Show how populations can increase through linear or exponential growth with corresponding effects on resource use and environmental pollution. (LS-11-7)</p> <p>* Recognize that populations can reach or temporarily exceed the carrying capacity of a given environment. Show that the limitation is not just the availability of space but the number of organisms in relation to resources and the capacity of earth systems to support life. (LS-11-8)</p> <p>* Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences. (LS-11-9)</p> <p>* Explain how environmental factors can influence heredity or development of organisms. (LS-11-10)</p> <p>* Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view the earth. (LS-11-11)</p> <p>* Relate diversity and adaptation to structures and functions of living organisms at various levels of organization. (LS-12-7)</p>	
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★ Based on the structure and stability of ecosystems and their nonliving components, predict the biotic and abiotic changes in such systems when disturbed (e.g., introduction of non-native species, climatic change, etc.). (LS-12-8)

★ Explain why and how living systems require a continuous input of energy to maintain their chemical and physical organization. Explain that with death and the cessation of energy input, living systems rapidly disintegrate toward more disorganized states. (LS-12-9)

Evolutionary Theory

★ Recognize that ecosystems change when significant climate changes occur or when one or more new species appear as a result of immigration or speciation. (LS-11-12)

★ Describe how the process of evolution has changed the physical world over geologic time. (LS-11-13)

★ Describe how geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Recognize that current methods include using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed. (LS-11-14)

★ Explain additional components of the evolution theory, including genetic drift, immigration, emigration and mutation. (LS-12-10)

Historical Perspectives and Scientific Revolutions

★ Trace the historical development of a biological theory or idea (e.g., genetics, cytology and germ theory). (LS-12-11)

★ Describe advances in life sciences that have important, long-lasting effects on science and society (e.g., biotechnology). (LS-12-12)

Sub-Objectives to Meet Indicators:

Population Dynamics

- Compare and contrast ecology, biosphere, and ecosystems.
- Distinguish between a habitat and a niche.
- Distinguish between a community and a population.
- List factors that cause changes in population size.
- List and explain the four density determiners (i.e., natality, mortality,

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	<p>immigration, and emigration).</p> <ul style="list-style-type: none">• Explain a population growth curve.• Compare and contrast the Malthusian Principle and Sigmoid Growth Curve.• Graph human population growth.• Explain techniques of measuring populations.• Compare and contrast predator-prey relationships.• Evaluate competition as a controlling factor in population growth.• Determine the role of mankind in relationship to changing populations.• Describe the major laws of ecology in relation to population growth. <p>Ecological Principals</p> <ul style="list-style-type: none">• Compare and contrast the roles of producers, consumers, and decomposers in a community.• Compare and contrast the roles of scavengers, saprophytes, and parasites.• Explain how energy flows through ecosystems.• Describe atrophic and heterotrophic relationships.• Distinguish among the various trophic levels.• Construct a food web.• Classify limnology as a division of ecology.• Compare and contrast ponds and streams in terms of chemical factors (oxygen, carbon dioxide, and pH levels).• List and discuss the types of pollution in a stream ecosystem.• Discuss the role of pollution-indicator organisms.• List and explain the adaptations of organisms, which allow them to live in a swift stream.• Research current ecological problems in the world.• Discuss temperature as a controlling factor.• Compare and contrast the heat holding capacity of a stream with that of a pond. <p>Animal Behavior</p> <ul style="list-style-type: none">• Describe mammalian reproductive behavior.• Explain the behavioral-physiological mechanism that operates to regulate population growth.• Recognize the relationship between the major laws of ecology and	
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	<p>population growth.</p> <ul style="list-style-type: none">• Describe the effects of territorial behavior.• Compare the various levels of a peck order.• Discuss the importance of threat postures in animals.• Discuss aggressiveness in a species in relation to sex, hunger, peck order, and introduction of new individuals.• Discuss the effects of crowding on individuals and groups.• Evaluate the pros and cons of using animals as research subjects. <p>Animal Physiology</p> <ul style="list-style-type: none">• List the roles of oxygen in animal respiration.• Discuss the importance of carbon dioxide in relation to maintaining respiration, fainting, and hyperventilation.• Explain how carbon monoxide kills organisms.• Compare and contrast tidal volume, vital capacity, and residual volume.• Form a comparative analysis of the metabolic rates of two animals.• Compare and contrast coagulants and anticoagulants.• Chart the blood coagulation process.• Describe the function of iron in the bloodstream.• Match enzymes with their function and give examples of enzyme systems.• Measure and explore human blood pressure.• Compare and contrast the countercurrent system in organisms (e.g., fish gills, fish airbladders, kidneys, heat exchange systems, etc.).• Compare and contrast ingestion, digestion, and nutrition.• Distinguish between intracellular digestion with extra cellular digestion.• Compare and contrast glycogen and cellulose.• Distinguish between fats and oils.• Differentiate among carbohydrates, lipids, and proteins.• Explain monosaccharides, disaccharides, and polysaccharides in terms of structural complexity.• Discuss the effects of cholesterol.• Describe the role of amino acids in the formation of proteins.• Match vitamins with their function.• Discuss the role of enzymes and hormones in digestion.• List and discuss the functions of the major digestive organs.	
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- Compare and contrast homothermic and poikilothermic organisms.
 - List what makes a given temperature lethal to an organism.
 - Discuss the brain as a temperature regulator.
 - List the mechanisms for producing heat, retaining heat, or cooling in animals.
 - Explain the thermoneutrality range and discuss its importance.
 - Describe what happens physiologically to an animal in hibernation compared to one in winter sleep.
 - Discuss the role of the circulatory system in maintaining a steady temperature in humans.
 - Describe ways in which animals can gain and/or lose water.
 - Discuss the role of hypophysis in controlling urine formation.
 - Explain the process of ultrafiltration
 - List adaptations for marine invertebrates that live in diluted concentrations near the mouth of rivers.
 - Compare and contrast the formation of ammonia, urea, and uric acid as nitrogenous waste products.
 - Draw and label the major parts of the kidney.
 - Describe the role of antidiuretic hormone.
 - Explain how diuretics work.
 - Explain why it is lethal to drink seawater.
 - Compare and contrast the unique problems of freshwater fish and marine fish in maintaining a proper salt and water balance.
 - Discuss the problems of desert animals in maintaining a proper water balance.
- Anatomy**
- Identify all major organs in an organism
 - Explain the functions of each organ in an organism.
 - Label all external anatomy structures.
 - Trace the pathway of blood through the major blood vessels.
 - Draw all major organs and place the body organs in the proper body system within an organism.