

## Norton City Schools Standards-Based Science Course of Study 2003

### HIGH SCHOOL ELECTIVE

### ANATOMY AND PHYSIOLOGY (USED AS A SEMESTER, YEAR-LONG OR BLOCK-SCHEDULED COURSE)

#### Life Sciences Standard

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><b><u>Life Sciences</u></b></p> <ul style="list-style-type: none"> <li>★ Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-A)</li> <li>★ Explain how humans are connected to and impact natural systems. (LS-B)</li> <li>★ Explain the interconnectedness of the components of a natural system. (LS-E)</li> <li>★ Explain how human choices today will affect the quality and quantity of life on earth. (LS-F)</li> <li>★ Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-G)</li> </ul>	<p>By the end of Eleventh/Twelfth Grades, the student will:</p> <p><b><u>Characteristics and Structure of Life</u></b></p> <ul style="list-style-type: none"> <li>★ 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)</li> <li>★ 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)</li> <li>★ 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)</li> <li>★ 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)</li> <li>★ 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)</li> </ul> <p><b><u>Diversity and Interdependence of Life</u></b></p> <ul style="list-style-type: none"> <li>★ Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences. (LS-11-9)</li> </ul>	

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<p>★ Explain how environmental factors can influence heredity or development of organisms. (LS-11-10)</p> <p>★ Relate diversity and adaptation to structures and functions of living organisms at various levels of organization. (LS-12-7)</p> <p><b><u>Historical Perspectives and Scientific Revolutions</u></b></p> <p>★ Trace the historical development of a biological theory or idea (e.g., genetics, cytology and germ theory). (LS-12-11)</p> <p>★ Describe advances in life sciences that have important, long-lasting effects on science and society (e.g., biotechnology). (LS-12-12)</p> <p><b><u>Sub-Objectives to Meet Indicators:</u></b></p> <p><b>Histology</b></p> <ul style="list-style-type: none"><li>• Identify the various body planes (e.g., coronal, sagittal, transverse, etc.) and directional terms (e.g., proximal, distal, anterior, posterior, etc.).</li><li>• Distinguish among the four tissue types.</li><li>• Utilizing a microscope, identify the four major layers of tissues.</li><li>• Differentiate among the different types of epithelial tissue.</li><li>• Characterize the principle types of membranes and their functions.</li><li>• Describe the development of the various types of tissues, the various types of cells in those tissues, and tissue and cell functions.</li></ul> <p><b>Integumentary System</b></p> <ul style="list-style-type: none"><li>• Describe the skin as an organ and describe its role in the proper functioning of a human being.</li><li>• Create a model displaying the various layers of skin and their characteristics.</li><li>• Characterize the physiological features of the skin.</li><li>• Identify and elaborate on the accessory structures of the skin (glands, hair, and nails).</li></ul> <p><b>Skeletal System</b></p> <ul style="list-style-type: none"><li>• Identify the organizational structure of the skeletal system and bones.</li><li>• Illustrate the structures/features of a bone.</li><li>• Distinguish among the five types of bone cells and identify them using a microscope.</li></ul>	
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- Discuss the growth and development of bone tissues.
- List and characterize the minerals, vitamins, and hormones involved in the proper functioning of bone tissue.
- Identify and label the bones of the axial skeleton and the appendicular skeleton.
- Compare and contrast the three principle kinds of joints and be able to associate the joint types with examples in the human body.
- Give examples of the various subcategories of each principle type of joint.
- Compare and contrast tendons and ligaments.

### **Muscles**

- Identify the structural components of a muscle and a muscle fiber.
- Distinguish among the different types of muscle tissue.
- Analyze the particular stages involved in a muscle contraction (e.g., using cat dissection, etc.).
- Explain how muscles are named according to their location and function.
- List and identify the various muscles of the axial and appendicular skeleton.
- Describe the nerve-muscle association required for proper muscle function/contraction.

### **Nerves**

- Describe the nervous system and its different categories of neurons.
- Analyze electrical activity in axons, incorporating ion gates, action potentials, conduction of nerve impulses, and synaptic joints.
- Explain the function of neurotransmitters and list several examples.

### **Central Nervous System**

- Identify the various physical components of the central nervous system (e.g., brain, spinal cord, etc.).
- Distinguish between gray matter and white matter.
- Recognize the relationship between cerebrospinal fluid and proper functioning of the brain.
- Identify and characterize the various parts of the spinal cord.
- Investigate major disorders of the nervous system.
- Trace the pathway of a nerve impulse.

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	<ul style="list-style-type: none"><li>• Differentiate between motor and sensory neurons.</li></ul> <p><b>Autonomic Nervous System (A.N.S.)</b></p> <ul style="list-style-type: none"><li>• Recognize the relationship of the A.N.S. to proper functioning of the body.</li><li>• Characterize autonomic neurons.</li><li>• Analyze the functions of the A.N.S.</li><li>• Analyze the characteristics of sensory receptors and categorize them.</li><li>• Classify and characterize the somatic senses.</li><li>• Describe, analyze, and identify the various component parts involved in tasting, smelling, and hearing.</li><li>• Characterize and analyze the various component parts involved in the proper functioning of the eye.</li></ul> <p><b>Endocrine System</b></p> <ul style="list-style-type: none"><li>• List and identify the various endocrine glands.</li><li>• Characterize the primary effects, target organs, and hormones associated with each endocrine gland.</li><li>• List and analyze the various disorders associated with the many endocrine glands.</li></ul> <p><b>Circulatory System</b></p> <ul style="list-style-type: none"><li>• Recognize the relationship between the functions of the circulatory system and proper health.</li><li>• Analyze the acid/base balance of the blood.</li><li>• Identify and characterize the structures of the heart.</li><li>• Trace the flow of blood through the heart.</li><li>• Investigate the electrical activity associated with the heart.</li><li>• Distinguish between the different types of blood vessels and their functions (e.g., using cat dissection, etc.).</li><li>• Identify the principle arteries and veins of the body.</li><li>• Recognize the relationship between blood pressure and proper health.</li><li>• Demonstrate the proper method for measuring blood pressure.</li></ul> <p><b>Blood</b></p> <ul style="list-style-type: none"><li>• Describe the composition of the plasma, the fluid portion of the blood.</li><li>• Differentiate between the solid components of the blood (erythrocytes,</li></ul>	
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	<p>leukocytes, and platelets) regarding structure, function, and origin.</p> <ul style="list-style-type: none"><li>• Trace the pathway required for normal blood clotting.</li><li>• Investigate the importance of knowing ABO blood grouping and RH blood typing for transfusion purposes.</li></ul> <p><b>Lymphatic System</b></p> <ul style="list-style-type: none"><li>• Draw and label a diagram of the body showing the major lymphatic structures.</li><li>• Compare and contrast the functions of the lymphatic.</li></ul> <p><b>Respiratory System</b></p> <ul style="list-style-type: none"><li>• Label a diagram of the respiratory structures.</li><li>• Trace the steps involved in the exchange of oxygen and carbon dioxide in the alveolar capillaries.</li><li>• Investigate the effects of exercise on the rate and volume of respiration.</li><li>• Explain the terms used to describe lung volumes and capacities.</li></ul> <p><b>Excretory System</b></p> <ul style="list-style-type: none"><li>• Describe the position and gross structure of the kidney and the structure of a nephron.</li><li>• Trace the pathway of glomerular filtration and re-absorption in the convoluted tubules of the nephron.</li><li>• Recognize the relationship between secretion of antidiuretic hormone and urine production.</li><li>• Describe the structure of the urinary bladder, ureters, and urethra.</li><li>• Explain the sequence of events involved in micturition.</li></ul> <p><b>Digestive System</b></p> <ul style="list-style-type: none"><li>• Label a diagram of the digestive system, including the organ ducts and sphincter valves.</li><li>• Separate the parts of a meal into the six chemical classes of food.</li><li>• Differentiate between the digestion and absorption of carbohydrates, proteins, and lipids.</li><li>• Identify the major aspects of neural and endocrine regulation of the digestive system.</li><li>• Trace the digestion of a simple meal from ingestion to elimination.</li></ul>	
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	<p><b>Reproductive System</b></p> <ul style="list-style-type: none"><li>• Locate the structures of the male reproductive system and describe the function of each.</li><li>• Characterize the factors that affect male fertility.</li><li>• Diagram and label the parts of the female reproductive system.</li><li>• Describe oogenesis and explain why meiosis of a primary oocyte results in only one ovum.</li><li>• Trace the events surrounding the hormonal control of the ovarian and menstrual cycles.</li><li>• Recount the structural changes by weeks during the fetal period.</li><li>• Describe the hormonal action, which controls labor and parturition.</li></ul>	
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