

Oakwood City School District Human Anatomy & Physiology Science Standards

One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.

Human Anatomy and Physiology is a high school level course, which satisfies the Ohio Core science graduation requirements of Ohio Revised Code Section 3313.603. This section of Ohio law requires three units of science. Each course should include inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information.

Human Anatomy and Physiology comprises a systematic study in which students will examine human anatomy and physical functions. They will analyze descriptive results of abnormal physiology and evaluate clinical consequences. A workable knowledge of medical terminology will be demonstrated.

Human Anatomy & Physiology Standards

Levels of Organization

- A. Hierarchy of Organization
 - a. Identify the levels of organization from cellular to organism.
 - b. Describe the function of the organ systems.
 - c. Recognize the hierarchy of cellular organization.
- B. Types of Tissues
 - a. Define a tissue and classify the tissues of the human body.
 - b. Describe the general features, functions and specific examples of all four types of tissues.
 - c. Describe the general features, functions and specific examples of three select types of membranes.
- C. Homeostasis
 - a. Identify examples of how the body uses homeostasis to maintain balance.
 - b. Differentiate between positive and negative feedback mechanisms.
- D. Anatomical Terminology
 - a. Define and label a diagram of a human body with directional terms, planes and cavities.

Support and Motion

- A. Integumentary System
 - a. Use microscopes, micrographs, models or illustrations to identify types of skin cells and accessory structures. Describe the process of tissue engineering and tissue donation. Describe what attributes need to be considered in order to be a tissue donor. List sensory structures in the integumentary system.
 - b. Explain the cause of homeostatic imbalances (e.g., burns, skin cancers, anhidrosis, acne, eczema, scleroderma).
 - c. Explain how UV light from sun or tanning salon exposure increases the risks of skin cancer.
- B. Skeletal System

- a. Create an illustration of a long bone and label all structures. Use models or illustrations to identify and name bones and important bony features of the human skeleton.
 - b. Identify, label and describe the types of bones using graphics, images, Xray images or lab bone specimens. Create an illustration of different stages of bone development and destruction, including fracture repair. List and describe factors that affect bone density.
 - c. Identify the movement involved in moving specified joints.
- C. Muscular System
- a. Provide an example of muscle fatigue and describe the physiology behind it.
 - b. Use microscopes, micrographs, models or illustrations to identify muscle tissue types.
 - c. Identify common muscle disorders and give common symptoms and treatments.

Integration and Coordination

- A. Nervous System
- a. Identify the main structures and functions of the central nervous system and the peripheral nervous system.
 - b. Using microscopes, micrographs, models or illustrations, identify the cells of the nervous tissue.
 - c. Use microscopes, micrographs, models or illustrations to identify the main structures of the brain.
 - d. Use microscopes, micrographs, models or illustrations to identify the main structures of a nerve.
 - e. Use microscopes, micrographs, models or illustrations to identify the main structures of the spinal cord.
 - f. List the functions of the cerebrum, cerebellum and brainstem.
 - g. Label illustrations or models of the human brain that include structure and function.
 - h. Use graphs of membrane potential vs. time; distinguish between depolarization, repolarization and hyperpolarization.
- B. Special Senses
- a. Sense of Sight
 - i. Trace the pathway of light through the eye. Use microscopes, micrographs, models or illustrations to identify the main structures of the eye, and their functions.
 - b. Senses of Hearing and Balance

- i. Use models or illustrations to identify the main structures in the inner, outer, and middle ear. Listen to different tones and identify patterns of hearing ability. Describe sensorineural and conductive hearing pathways.
 - c. Senses of Taste and Smell
 - i. Use models, illustrations or slides to identify the anatomical structures related to taste and smell (e.g., taste buds, gustatory cells, papillae, cilia).
- C. Endocrine System:
 - a. Use models and/or illustrations to identify the main structures associated with glands and their associated target cells/organs.
 - b. Draw examples of negative and positive feedback loops. Predict the effect of changes in hormone levels.

Transport

- A. Blood
 - a. Create labeled illustrations or models of the components of whole blood. Identify the structure and function of red blood cells (erythrocytes). Describe the process of hemostasis. Explain the function of blood and each of the components of whole blood.
 - b. Create a labeled illustration or model of blood to explain the relationship between antigens, antibodies and blood type (e.g., ABO/Rh)
 - c. Explain the role of hemoglobin.
- B. Cardiovascular System
 - a. Create labeled illustrations or models to describe the pathway of blood through the valves, chambers and major vessels of the heart.
 - b. Create labeled illustrations or models to describe the pathway of blood through the pulmonary and systemic circuits.
 - c. Identify the functions of the cardiovascular system.
 - d. Identify the cells and tissues of the cardiovascular system.
 - e. Identify the components of cardiac output. Explain the relationship between heart rate, volume and cardiac output.
 - f. Match electrocardiogram (ECG/EKG) waves to events in the cardiac cycle.
 - g. Describe the features of an electrocardiogram (ECG/EKG) used to identify homeostatic imbalances.
 - h. Identify homeostatic imbalances of the cardiovascular system.
- C. Lymphatic and Immune Systems

- a. Create labeled illustrations or models of the cells of the immune system. Explain how the immune system works.
- b. Describe the uses for Enzyme-Linked Immunosorbent Assay (ELISA).
- c. Identify and describe the structures and functions of the lymphatic system.
- d. Create a flowchart to demonstrate the circulation of lymph throughout the body.
- e. Describe the mechanisms of autoimmune responses.

Absorption and Excretion

A. Digestive System:

- a. Trace food from the mouth to the anus and describe what happens in each region.
- b. Describe the structure and function of accessory digestive organs.
- c. Explain the role of a specific enzyme in the digestive process. Include where it is produced, where it enters the alimentary canal, the pH range in which it works best, the types of molecules it chemically digests and what products the chemical breakdown forms.
- d. Distinguish mechanical from chemical digestion.
- e. Identify the regions of the stomach and their functions.
- f. Identify tissue and cell types in digestive and accessory organs using microscopes, slides, microg

B. Respiratory System

- a. Identify sections of the respiratory tree by histological slides/images.
- b. Explain how the structure in each portion of the respiratory tree supports its function.
- c. List the normal respiratory volumes.
- d. Explain what factors alter respiratory volumes.
- e. Name muscles used for inspiration and expiration.

C. Urinary System

- a. Trace the formation of urine through the processes of osmosis and diffusion.
- b. Describe the basic physiological processes accomplished by the nephron (filtration, reabsorption, secretion).
- c. Describe the process by which the body eliminates excess fluids. Identify normal urine concentrations.
- d. Illustrate or describe the roles of osmosis and diffusion in the process of urine formation.

- e. Explain how molecules/hormones influence the body's hydration status.
- f. Identify the impacts of drinking too much water (i.e., hyperhydration).
- g. Describe the gross and histological structure of the urinary bladder.
- h. Relate the structure of the urinary bladder to its function.
- i. Illustrate filtration, secretion and reabsorption of ions/molecules in the kidney. Explain the relationship between the renal system and other organ systems (e.g., vascular). Include complications of renal failure.

Reproduction

A. Reproductive System

- a. Identify the structures of the male reproductive system and the functions of each structure. Identify the structures of the female reproductive system and the functions of each structure. Explain the pathway of a gamete through each reproductive system. Compare the processes of oogenesis and spermatogenesis