

Subject: Human Anatomy & Physiology 2

Unit 1: Endocrine System

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

The endocrine system utilizes chemicals, body fluids, and nerve impulses in working with the nervous system to regular bodily functions and homeostasis.

Unit 1: Endocrine System

3.1.12.A1.

Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A5.

Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none">• The endocrine system works in conjunction with the nervous system to maintain homeostasis through cell to cell communication.• The endocrine system controls and regulates metabolic processes to maintain a relatively constant internal environment and yet meet the changing needs of the body.	<ul style="list-style-type: none">• What are the major endocrine organs of the body?• In what way(s) are endocrine glands stimulated to release their hormones?• What controls the release of hormones by the anterior pituitary?• Which two hormones are involved in the regulation of the fluid and electrolyte balance of the body?

<ul style="list-style-type: none"> • The major endocrine organs of the body include the pituitary, thyroid, parathyroid, adrenal, pineal, and thymus glands, the pancreas, and the gonads. • Endocrine organs are activated to release their hormones into the blood by hormonal, humoral, or neural stimuli. • In general, the endocrine system becomes less efficient as we age which could lead to diabetes and depression of the immune system. • In addition to the major endocrine organs, pockets of hormone-producing cells are found in the walls of the small intestine, stomach, kidneys, and heart. 	<ul style="list-style-type: none"> • What are some problems individuals have as a result of a decrease in hormone production? • What are the major endocrine organs? • In what ways are endocrine glands stimulated to release their products? • How do different classes of hormones work in their respective target cells?
<p>Knowledge:</p>	<p>Skills:</p>
<ul style="list-style-type: none"> • Vocabulary: hormone, target cell, steroid hormone, nonsteroid hormone, receptor cell, second messenger, prostaglandins, releasing hormones, cortex, medulla, stress • Describe the major functions of the endocrine system. • Compare and contrast endocrine and exocrine glands. 	<ul style="list-style-type: none"> • Explain the structural and functional classifications of the endocrine system. • State the functions steroid and nonsteroid hormones and their relationship to receptor cells. • Describe the source of specificity of the endocrine system. • Name some functions of hormones. • Discuss how negative feedback systems regulate hormone secretion. • Explain how the nervous system controls hormone secretion. • Name and describe the locations of major endocrine glands, and list the hormones they secrete.

Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> • Homework • Quizzes • Tests • Projects • Inquiry Based Activities • Class discussion/ group work 	<ul style="list-style-type: none"> • Define hormone and describe how they bring about their effects in the body. • Describe the difference between endocrine and exocrine glands. • Using a diagram, identify the major endocrine glands and tissues. • List hormones produced by the endocrine glands and discuss their general functions. • Explain the functional relationship between the hypothalamus and the pituitary gland. • Indicate the endocrine role of the kidneys, stomach, intestine, heart, and the placenta. • Describe the effect of aging on the endocrine system and body homeostasis.

Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> • A&P text: Hole's Essentials of Human Anatomy and Physiology, 9th edition • Endocrine system model. • A&P Coloring Book • Laboratory experiments • Mini-activities (e.g. simulations) • Worksheets (e.g. anatomy coloring book) • Computer-assisted instruction • Cooperative learning - problem solving 	<ul style="list-style-type: none"> • Materials necessary to complete performance tasks. • Direct teacher instruction • Demonstrations

<ul style="list-style-type: none">• Videos• Library research	
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Subject: Human Anatomy & Physiology 2

Unit 2: Blood

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

Blood is a type of connective tissue whose cells are suspended in a liquid matrix. Blood is vital in transporting substances between body cells and the external environment, thereby promoting homeostasis.

Unit 2: Blood

<p>3.1.12.A1. Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.</p> <p>3.1.12.A5. Analyze how structure is related to function at all levels of biological organization from molecules to organisms.</p> <p>3.1.12.A6. Analyze how cells in different tissues/organs are specialized to perform specific functions.</p>

<p>Overarching Understanding:</p> <ul style="list-style-type: none">• Big Ideas: Structure is related to function at all biological levels of organization.• Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.
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Topical Understandings:	Essential Questions:
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<ul style="list-style-type: none"> • The structure of blood helps meet the oxygenation needs of the cells, allows recognition and rejection of foreign protein, and controls the coagulation of blood. • The three major components of blood are erythrocytes (RBCs), leukocytes (WBCs) and thrombocytes (platelets). • When bacteria, viruses, or other foreign substances invade the body, WBCs increase in number to fight them in various ways. • The blood group most commonly typed for is ABO. • Platelets are necessary for the clotting process that occurs in plasma when blood vessels are ruptured. 	<ul style="list-style-type: none"> • What is the blood volume of an average-sized adult? • What are the living blood cells that make up about 45% of whole blood? • What is the liquid portion of blood called and what is it mostly comprised of? • What is anemia and what are the possible causes? • What conditions are seen with an increase in the number of white blood cells?
<p>Knowledge:</p>	<p>Skills:</p>
<ul style="list-style-type: none"> • Vocabulary: hematocrit, plasma, erythrocyte, hemoglobin, oxyhemoglobin, deoxyhemoglobin, erythropoietin, leukocytes, interleukins, granulocytes, agranulocytes, leukocytosis, leukopenia, thrombocytes, megakaryocytes, thrombopoietin, albumins, globulins, fibrinogen, lipoprotein, nonprotein nitrogenous substances, hemostasis, vasospasm, coagulation, thrombus, embolus, agglutination, antigens(agglutinogens), antibodies(agglutinins), erythroblastosis fetalis • Describe the components of whole blood, and relate each to its role in maintaining homeostasis. 	<ul style="list-style-type: none"> • Describe the composition of plasma and discuss its importance in the body. • List the cell types comprising the formed elements and describe the major functions of each type. • Describe the blood-clotting process and identify factors that may inhibit or enhance it. • Identify the ABO and Rh blood groups. • Indicate blood disorders that increase in frequency in the aged.

Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> • Homework 	<ul style="list-style-type: none"> • Describe the overall composition of plasma, including the major types of plasma proteins,

<ul style="list-style-type: none"> • Quizzes • Tests • Projects • Inquiry Based Activities • Class discussion/ group work 	<p>their functions and where in the body they are produced.</p> <ul style="list-style-type: none"> • Identify microscopically each of the following: erythrocytes (red blood cells or RBCs), the five types of leukocytes (white blood cells or WBCs), and thrombocytes (platelets). • Discuss the structure and function of hemoglobin, as well as its breakdown products. • Describe functions for each of the five major types of leukocytes as well as the two major subtypes of lymphocytes (T and B). • Explain how the positive feedback loops in the platelet and coagulation phases promote hemostasis. • Explain the role of surface antigens on RBCs in determining blood groups. • List the type of antigen and the type of antibodies present in each ABO blood type. • State which blood type is considered the universal donor and which blood type is considered the universal recipient, and explain why.
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Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> • A&P text: Hole's Essentials of Human Anatomy and Physiology, 9th edition • Light microscope • A&P Coloring Book • Laboratory experiments • Mini-activities (e.g. simulations) • Worksheets (e.g. anatomy coloring book) • Computer-assisted instruction • Cooperative learning - problem solving • Direct teacher instruction • Demonstrations • Videos • Library research 	<ul style="list-style-type: none"> • Materials necessary to complete performance tasks. •

Subject: Human Anatomy & Physiology 2

Unit 3: Cardiovascular System

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

The cardiovascular system is composed of the heart and blood vessels. It transports blood between body cells and organs that communicate with the external environment.

Unit 3: Cardiovascular System

3.1.12.A1.

Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A5.

Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none">• In conjunction with blood and the respiratory system, the cardiovascular system transports oxygen and nutrients to the cells, and transports wastes away from the cells.• The majority of the heart is composed of cardiac muscle. It has four hollow chambers (two atria and two ventricles).	<ul style="list-style-type: none">• What are the major structures of the circulatory system?• How does the heart's ability to contract differ from that of other muscles of the body?• What vital role does blood pressure play?

<ul style="list-style-type: none"> • Arteries carry blood away from the heart and veins transport it back. • Blood pressure is the pressure that blood exerts on the walls of the blood vessels. • Arteriosclerosis is an expected consequence of aging. • Cardiovascular disease is an important cause of death in individuals over age 65. 	
Knowledge:	Skills:
<ul style="list-style-type: none"> • Vocabulary: heart, pericardium, epicardium, myocardium, endocardium, atrium, ventricle, artery, septum, valve, chordae tendineae, pulmonary circuit, systemic circuit, vein, capillary, blood pressure, systole, diastole, cardiac cycle, heart sounds, murmur, functional syncytium, cardiac conduction system, automaticity, sinoatrial node, atrioventricular node, atrioventricular bundle, Purkinje fibers, ECG, vasoconstriction, vasodilation, blood pressure, systolic pressure, diastolic pressure, hypertension • Name the organs of the cardiovascular system, and discuss their functions. • Identify and locate the major parts of the heart. • Identify the components of the cardiac cycle. 	<ul style="list-style-type: none"> • Describe the location of the heart in the body and identify its major anatomical areas. • Trace the pathway of blood through the heart. • Define systole, diastole, and cardiac cycle. • Explain the operation of the heart valves and define heart sounds and murmur. • Explain what information can be gained from an electrocardiogram. • Compare and contrast the structure and function of arteries, veins, and capillaries. • Define systolic and diastolic blood pressure and interpret a graph of aortic pressure versus time during the cardiac cycle. • List factors affecting and or determining blood pressure. • Define hypertension and atherosclerosis and describe health consequences of these conditions.

Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none">• Homework• Quizzes• Tests• Projects• Inquiry Based Activities• Class discussion/ group work	<ul style="list-style-type: none">• Describe the major functions of the cardiovascular system.• On the external heart identify the location of the four chambers as well as the coronary sulcus, anterior interventricular sulcus and posterior interventricular sulcus.• Identify and describe the function of the primary internal structures of the heart, including chambers, septa, valves, papillary muscles, chordae tendineae, and venous and arterial openings.• Compare and contrast the structure and function of the atrioventricular and the semilunar valves.• Describe the layers of the pericardium and the location of the pericardial cavity.• Identify the right and left coronary arteries and their branches, the cardiac veins, and the coronary sinus.. Identify the major blood vessels entering and leaving the heart and classify them as either an artery or a vein and as containing either oxygen-rich or oxygen-poor blood.• Describe blood flow through the heart naming all chambers and valves passed.• Explain how the heart is a double pump and why this is significant.• List the parts of the conduction system and explain how the system functions.• Define automaticity and explain why the SA node normally paces the heart.• Relate the waveforms to atrial and ventricular depolarization and repolarization and to the activity of the conduction system.• Relate the EKG waveforms to the normal mechanical events of the cardiac cycle.• Explain how atrial systole is related to ventricular filling.• Relate the heart sounds to the events of the cardiac cycle.• Compare and contrast the structure of arteries and veins and arterioles and venules.• Correlate the anatomical structure of each type of blood vessel with its function.• Describe the systemic and pulmonary circuits and discuss the functions of each.• Provide specific examples to demonstrate how the cardiovascular system responds to maintain homeostasis in the body.• Predict factors or situations affecting the cardiovascular system that could disrupt homeostasis.

- Predict the types of problems that would occur in the body if the cardiovascular system could not maintain homeostasis.

Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> • A&P text: Hole’s Essentials of Human Anatomy and Physiology, 9th edition • Heart model • Pig heart specimens to dissect • A&P Coloring Book • Laboratory experiments • Mini-activities (e.g. simulations) • Worksheets (e.g. anatomy coloring book) • Computer-assisted instruction • Cooperative learning - problem solving • Videos • Library research 	<ul style="list-style-type: none"> • Materials necessary to complete performance tasks. • Direct teacher instruction • Demonstrations

Subject: Human Anatomy & Physiology 2

Unit 4: Lymphatic System and Immunity

Grade Level: 11-12

Designed by: Maria O’Boyle

Brief Summary of Unit:

The lymphatic system includes a network of closed-ended vessels that transport fluids. These vessels carry away excess fluid from interstitial spaces and return it to the blood. Cells and biochemicals of the lymphatic system launch attacks against foreign particles, enabling the body to destroy infectious microorganisms and viruses.

Unit 4: Lymphatic System and Immunity

3.1.12.A1.

Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A5.

Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none">• The lymphatic system is closely associated with the cardiovascular system. It transports excess fluid into the bloodstream, absorbs fats, and helps defend the body against disease-causing agents.	<ul style="list-style-type: none">• What are the major structures of the lymphatic system?• What is the most important function of the lymphatic vessels and the lymph nodes?• How is lymph formed?• How does your body defend against infection?
Knowledge:	Skills:
<ul style="list-style-type: none">• Vocabulary: lymph, lymph node, lymphatic vessels, lymphatic trunks, lymphocytes, hilum, nodule, sinus, thymus,	<ul style="list-style-type: none">• Identify and label major lymphatic organs and vessels.• Trace the general pathway of lymph from the interstitial

<p>spleen, pathogen, infection, innate(nonspecific) defense, adaptive(specific) defense, immunity, species resistance, mechanical barrier, chemical barrier, interferon, inflammation, pus, antigen, hapten, antibodies, complement, vaccine, allergen, autoimmunity</p> <ul style="list-style-type: none"> ● Identify the locations of the major lymphatic organs and pathways. <ul style="list-style-type: none"> ● Describe the structure of a lymph node. 	<p>spaces to the bloodstream.</p> <ul style="list-style-type: none"> ● Describe the structure of a lymph node. ● Describe the mechanisms of lymph formation & circulation ● Identify and describe the gross anatomical features of each organ or tissue. ● Name the surface membrane barriers and describe their physical, chemical, and microbiological mechanisms of defense. ● Distinguish between active and passive immunity. ● Define diapedesis, chemotaxis, opsonization, and membrane attack complex and explain their importance for innate defenses.
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Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> ● Homework ● Quizzes ● Tests ● Projects ● Inquiry Based Activities ● Class discussion/ group work 	<ul style="list-style-type: none"> ● Compare and contrast lymphatic vessels and blood vessels in terms of structure and function. ● Compare and contrast innate (nonspecific) defenses with adaptive (specific) defenses. ● Describe the roles of various types of leukocytes in innate and adaptive body defenses. ● Distinguish among the various types of lymphocytes, including helper T cells, cytotoxic T cells, regulatory (or suppressor) T cells, B cells, plasma cells, and memory cells.

- Analyze ways in which the innate and adaptive body defenses cooperate to enhance the overall resistance to disease.
- Describe the steps involved in phagocytosis and provide examples of important phagocytic cells in the body.
- Explain how complement and interferon function as antimicrobial chemicals.
- Explain why inflammation can be beneficial.
- Describe the mechanism of fever and the role of pyrogens.
- Interpret a graph of the primary and secondary immune response, in terms of the relative concentrations of different classes of antibodies produced over time.
- Describe natural and artificial examples of both active and passive immunity.
- Provide examples of how applied immunology can be used to diagnose, treat and prevent diseases.
- Provide specific examples to demonstrate how the lymphatic and immune systems respond to maintain homeostasis in the body.
- Explain how the lymphatic and immune systems relate to other body systems to maintain homeostasis.
- Predict factors or situations affecting the lymphatic and immune systems that could disrupt homeostasis
- Predict the types of problems that would occur in the body if the lymphatic and immune systems could not maintain homeostasis.

Materials and Resources

Source	Description of Use
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<ul style="list-style-type: none"> ● A&P text: Hole's Essentials of Human Anatomy and Physiology, 9th edition ● A&P Coloring Book ● Laboratory experiments ● Mini-activities (e.g. simulations) ● Worksheets ● Computer-assisted instruction ● Cooperative learning - problem solving ● Videos ● Library research 	<ul style="list-style-type: none"> ● Materials necessary to complete performance tasks. ● Direct teacher instruction ● Demonstrations
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Subject: Human Anatomy & Physiology 2

Unit 5: Digestion

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

Digestion is the mechanical and chemical breakdown of foods and the absorption of nutrients by cells. The digestive system consists of the alimentary canal and several accessory organs that secrete substances used in the process of digestion.

Unit 5: Digestion

3.1.12.A1.
 Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.
 3.1.12.A5.
 Analyze how structure is related to function at all levels of biological organization from molecules to organisms.
 3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none"> • Knowledge of the digestive systems illustrates how fuel is made available for metabolism, which enables the cells to function, grow, and reproduce. • The digestive system consists of a hollow tube extending from the mouth to anus (alimentary canal) and several accessory digestive organs. • The major organs of alimentary canal include the mouth (lips, cheeks, teeth, tongue, palate), pharynx, esophagus, stomach, small intestine, and the large intestine. • Some of the accessory organs of the digestive system include the pancreas, liver, gall bladder, and the salivary glands. 	<ul style="list-style-type: none"> • What is the main function of digestion? • What are the major organs of the digestive system? • What are the three pairs of salivary glands called and what are two functions of saliva? • Why is it necessary for the stomach contents to be so acidic? • What are the most common conditions or disorders that are related to the digestive system?
Knowledge:	Skills:
<ul style="list-style-type: none"> • Vocabulary: alimentary canal, mucosa, lumen, submucosa, serosa, peristalsis, frenulum, papillae, lingual, uvula, amylase, parotid glands, submandibular glands, sublingual glands, pharynx, nasopharynx, oropharynx, laryngopharynx, bolus, chyme, sphincter, pepsin, pepsinogen, intrinsic factor, gastrin, cholecystokinin, lipase, protease, peptidase, nuclease, secretin, hepatic, bile, duodenum, jejunem, ileum, 	<ul style="list-style-type: none"> • Name the organs of the alimentary canal and accessory digestive organs and identify their location. • Identify the overall function of the digestive system as digestion and absorption of foodstuffs, and describe the general activities of each of the digestive system organs. • Describe the composition and function(s) of saliva. • Describe how foodstuffs in the digestive tract are mixed and moved along the tract.

<p>mesentery, villi, lacteal, cecum, feces</p> <ul style="list-style-type: none"> • Describe the major functions of the digestive system. • Identify the boundaries of the oral cavity. • Identify the naso-, oro- and laryngopharynx and classify these regions with respect to passage of food and/or air through them. 	<ul style="list-style-type: none"> • List the major enzymes or enzyme groups produced by the digestive organs or accessory glands and name the foodstuffs on which they act.
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Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> • Homework • Quizzes • Tests • Projects • Inquiry Based Activities • Class discussion/ group work 	<ul style="list-style-type: none"> • Identify, and describe the histological structure and the function of, each of the four layers of the wall - the mucosa, the submucosa, the muscularis externa, and the serosa (visceral peritoneum) • Describe the structure and discuss the function of the upper esophageal and lower esophageal (cardiac) sphincters. • Describe the structure and discuss the function of the cardiac and pyloric sphincters. • Identify the structure and discuss the function of the cardiac region, the fundus, the body and the pyloric region of the stomach. • Discuss the significance of rugae. • Identify the location and discuss the relative length and the functions of the duodenum, jejunum, and ileum. • Describe the structure and discuss the function of the ileocecal valve and the internal and external anal sphincters. • Identify the location and discuss the functions of the cecum and appendix, the

	<p>ascending, transverse, descending, and sigmoid colon, the rectum, and the anus.</p> <ul style="list-style-type: none"> • Identify the hepatic artery, hepatic portal vein, and hepatic vein and discuss the function of each of those blood vessels. • Identify the pancreatic duct and the hepatopancreatic sphincter and discuss their roles in the flow of pancreatic enzymes. • Differentiate between intraperitoneal and retroperitoneal location of digestive structures. • Describe the defecation reflex and the function of the internal and external anal sphincters. • Provide specific examples to demonstrate how the digestive system responds to maintain homeostasis in the body. • Explain how the digestive system relates to other body systems to maintain homeostasis. • Predict factors or situations affecting the digestive system that could disrupt homeostasis. • Predict the types of problems that would occur in the body if the digestive system could not maintain homeostasis.
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Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> • A&P text: Hole's Essentials of Human Anatomy and Physiology, 9th edition • Human torso model • A&P Coloring Book • Laboratory experiments • Mini-activities (e.g. simulations) • Worksheets 	<ul style="list-style-type: none"> • Materials necessary to complete performance tasks. • Direct teacher instruction • Demonstrations

- Computer-assisted instruction
- Cooperative learning - problem solving
- Videos
- Library research

Subject: Human Anatomy & Physiology 2

Unit 6: Respiratory System

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

Obtaining oxygen and removing carbon dioxide are the primary functions of the respiratory system. The respiratory organ also entrap particles from incoming air, help control temperature and water content of the air, produce vocal sounds, and participate in the sense of smell and the regulation of blood pH.

Unit 6: Respiratory System

3.1.12.A1.

Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A5.

Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external

environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none">• Knowledge of how air is taken into the lungs and oxygen and carbon dioxide exchanged, as well as how this is controlled, is vital to understanding how cells produce energy to sustain life.• The organs of the respiratory system include the nose, pharynx, larynx, trachea, bronchi, and the lungs.• Breathing, or pulmonary ventilation, is a mechanical process that depends on volume changes occurring in the thoracic cavity.• The major respiratory disorders are emphysema, bronchitis, and lung cancer.• Changes in blood levels of carbon dioxide are the most important stimuli affecting respiratory rhythm	<ul style="list-style-type: none">• What is the main function of respiration?• What are the major organs of the respiratory system?• What is the difference between external and internal respiration?• What two chemical factors modify respiratory rate and depth?• What are the major respiratory disorders?
Knowledge:	Skills:
<ul style="list-style-type: none">• Vocabulary: respiration, nasal conchae, pharynx, larynx, trachea, glottis, bronchial tree, primary bronchi, bronchioles, alveolar ducts, alveolar sacs, alveoli, pleural cavity, inspiration, expiration, surface tension, surfactant, respiratory cycle, tidal volume, resting tidal volume, inspiratory tidal volume, inspiratory reserve volume, residual volume, vital capacity, inspiratory capacity, functional residual capacity, total lung capacity, partial pressure, hypoxia, carbaminohemoglobin, bicarbonate ions, carbonic anhydrase, emphysema, COPD• Respiration is the entire process of gas exchange between the atmosphere and body cells.• The upper respiratory tract includes the nose, nasal cavity, paranasal sinuses, and pharynx.	<ul style="list-style-type: none">• Name the organs forming the respiratory passageway from the nasal cavity to the alveoli of the lungs and describe the function of each.• Describe the structure and function of the lungs and the pleural coverings.• Explain how the respiratory muscles cause volume changes that lead to air flow into and out of the lungs.• Name brain areas involved in the control of respiration and name several physical factors that influence respiratory rate.• Describe the symptoms and probable causes of COPD and lung cancer.

- The lower respiratory tract includes the larynx, trachea, bronchial tree, and lungs.

Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> • Homework • Quizzes • Tests • Projects • Inquiry Based Activities • Class discussion/ group work 	<ul style="list-style-type: none"> • Describe the four respiratory processes - ventilation, external respiration (gas exchange at lung), internal respiration (gas exchange at body tissues), and cellular respiration • Describe and distinguish between the upper and lower respiratory tracts. • List, in order, the respiratory structures that air passes through during inspiration. • Relate the anatomical structures of the respiratory system to adjacent organs and tissues. • Describe the changes in epithelial and connective tissue seen in various portions of the air passageways and relate these changes to function. • Identify the muscles used during quiet inspiration, during forced inspiration, and during forced expiration, as well as the nerves responsible for stimulating those muscles. • Explain how each of the following affect pulmonary ventilation: bronchiolar smooth muscle contractions, lung and thoracic wall compliance and recoil, and pulmonary surfactant and alveolar surface tension. • Describe the forces that tend to collapse the lungs and those that normally oppose or prevent collapse. • determine values for the respiratory volumes (IRV, TV, ERV, and RV) and the respiratory capacities (IC, FRC, VC, and TLC). • Analyze how oxygen and carbon dioxide movements are affected by changes in

	<p>partial pressure gradients (e.g., at high altitude), surface area, diffusion distance, and solubility and molecular weight of the gases.</p> <ul style="list-style-type: none"> ● Explain the factors that maintain oxygen and carbon dioxide gradients between blood and tissue cells. ● State the reversible chemical equation for oxygen binding to hemoglobin and predict how raising or lowering the partial pressure of oxygen will shift the equilibrium. ● State the reversible chemical equation for the reaction of carbon dioxide and water to carbonic acid and then to hydrogen ion and bicarbonate ion. ● State the reversible chemical equation for carbon dioxide binding to deoxyhemoglobin and predict how changing carbon dioxide concentrations will affect deoxyhemoglobin levels in the tissues and the lungs. ● Provide specific examples to demonstrate how the respiratory system responds to maintain homeostasis in the body. ● Explain how the respiratory system relates to other body systems to maintain homeostasis. ● Predict factors or situations affecting the respiratory system that could disrupt homeostasis. ● Predict the types of problems that would occur in the body if the respiratory system could not maintain homeostasis.
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Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> ● A&P text: Hole’s Essentials of Human Anatomy and Physiology, 9th edition ● Human torso model ● Inflatable lungs 	<ul style="list-style-type: none"> ● Materials necessary to complete performance tasks. ● Direct teacher instruction ● Demonstrations

<ul style="list-style-type: none">● Preserved lung● Wet spirometer● A&P Coloring Book● Laboratory experiments● Mini-activities (e.g. simulations)● Worksheets● Computer-assisted instruction● Cooperative learning - problem solving● Videos● Library research	
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Subject: Human Anatomy & Physiology 2

Unit 7: Urinary System

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

The urinary system helps maintain the normal concentrations of water and electrolytes within body fluids, regulates pH and volume of body fluids, and helps control red blood cell production and blood pressure.

Unit 7: Urinary System

- 3.1.12.A1.
Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.
- 3.1.12.A5.
Analyze how structure is related to function at all levels of biological organization from molecules to organisms.
- 3.1.12.A6.
Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:

- The urinary system helps maintain homeostasis by excreting nitrogenous waste products and selectively excreting or retaining water and electrolytes.
- The kidneys are the major organs that comprise the urinary system.
- The ureters connect each kidney to the urinary bladder which functions to store urine.
- The urethra is a tube that leads urine from the bladder to the outside of the body.
- Renal failure is a problem in which the kidneys are unable to concentrate urine and dialysis must be done to maintain chemical homeostasis of blood.

Essential Questions:

- What are the organs of the urinary system and their general function?
- In addition to eliminating the body of wastes, what are three other ways the kidney adjusts blood chemistry?
- What three substances not normally found in urine are normally found in the blood?
- What type of problem most commonly affects the urinary system organs?
- What changes occur with the kidneys and bladder function because of old age?

Knowledge:

- Vocabulary: renal, nephron, glomerulus, glomerular capsule, afferent arteriole, efferent arteriole, peritubular capillary, juxtaglomerular apparatus, urine, glomerular filtrate, tubular reabsorption, tubular secretion, urea, uric acid, ureter, urinary bladder, detrusor muscle, micturition, urethra
- The urinary system consists of the kidneys, ureters, urinary bladder, and urethra.
- Nephrons remove wastes from the blood and regulate water and electrolyte concentrations. Urine is the end product.

Skills:

- Describe the location of the kidneys in the body.
- Recognize that the nephron is the structural and functional unit of the kidney and describe its anatomy.
- Explain the process of urine formation, identifying the areas of the nephron that are responsible for filtration, reabsorption, and secretion and describe the composition of urine.
- Identify the general structure and function of the ureters, bladder, and urethra.
- Name three common urinary tract problems and explain the effects of aging on the urinary system.

Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none">• Homework• Quizzes• Tests• Projects• Inquiry Based Activities• Class discussion/ group work	<p>Describe the major functions of the urinary system.</p> <p>Describe the external structure of the kidney, including its location, support structures and covering.</p> <p>Identify, and describe the structure and location of, the ureters, urinary bladder and urethra.</p> <ul style="list-style-type: none">• Compare and contrast the male and female urethras.• Trace the path of blood through the kidney.• Identify the major structures and subdivisions of the renal corpuscles, renal tubules and renal capillaries.• Compare and contrast the structure and function of glomerular and peritubular capillaries.• Identify the location, structures and cells of the juxtaglomerular apparatus.• Trace the path of filtrate/urine from the renal corpuscle to the urethral opening.• Explain the anatomical features that create high glomerular capillary blood pressure and explain why this blood pressure is significant for urine formation.• Describe glomerular filtration rate (GFR), state the average value of GFR, and explain how clearance rate can be used to measure GFR.• Predict specific factors that will increase or decrease GFR.• Compare and contrast passive and active tubular reabsorption.• Explain why the differential permeability or impermeability of specific sections of the nephron tubules is necessary for urine formation.• Explain the role of the loop of Henle, the vasa recta, and the countercurrent multiplication mechanism in the concentration of urine.• Compare and contrast reabsorption and tubular secretion, with respect to direction of solute movement, strength of concentration gradients, and energy required.• Explain how the three processes in urine formation determine the rate of excretion

	<p>of any solute.</p> <ul style="list-style-type: none"> ● Compare and contrast blood plasma, glomerular filtrate, and urine and then relate their differences to function of the nephron. ● Determine the physical and chemical properties of a urine sample and relate these properties to normal urine composition. ● Predict specific factors involved in creating dilute versus concentrated urine. ● Explain the mechanism of action of diuretics. ● Describe the micturition reflex. ● Provide specific examples to demonstrate how the urinary system responds to maintain homeostasis in the body. ● Explain how the urinary system relates to other body systems to maintain homeostasis. ● Predict factors or situations affecting the urinary system that could disrupt homeostasis. ● Predict the types of problems that would occur in the body if the urinary system could not maintain homeostasis.
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Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> ● A&P text: Hole's Essentials of Human Anatomy and Physiology, 9th edition ● Preserved kidney ● A&P Coloring Book ● Laboratory experiments ● Mini-activities (e.g. simulations) ● Worksheets ● Computer-assisted instruction 	<ul style="list-style-type: none"> ● Materials necessary to complete performance tasks. ● Direct teacher instruction ● Demonstrations

- Cooperative learning - problem solving
- Videos
- Library research

Subject: Human Anatomy & Physiology 2

Unit 8: Reproduction and Development

Grade Level: 11-12

Designed by: Maria O'Boyle

School District: Tunkhannock Area School District

School: High School

Brief Summary of Unit:

The male and female reproductive systems produce and nurture sex cells and transport them to sites of fertilization. After fertilization, the journey of prenatal development begins. Following birth, the postnatal period begins at birth and ends at death.

Unit 8: Reproduction and Development

3.1.12.A1.

Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A5.

Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.1.12.A6.

Analyze how cells in different tissues/organs are specialized to perform specific functions.

Overarching Understanding:

- Big Ideas: Structure is related to function at all biological levels of organization.
- Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Topical Understandings:	Essential Questions:
<ul style="list-style-type: none"> • Reproductive systems are essential to survival of the species, but not to survival of the individual. • Spermatogenesis and oogenesis involve meiosis and produce gametes. • Reproductive organs mature and become functional at puberty. • Pregnancy begins at fertilization and consists of three periods called trimesters, each about three months long. • Stages of prenatal development occur at specific times. 	<ul style="list-style-type: none"> • What are the organs of the male reproductive system and their general function? • What are the organs of the female reproductive system and their general function? • What is spermatogenesis and when does it occur? • What are the events of the menstrual cycle and why is it so important? • What are the stages of reproduction from fertilization to childbirth? • What are the stages of pregnancy? • What are the hormonal changes that occur during pregnancy? • Which systems develop during each stage of pregnancy? • What is the sequence of events that lead to childbirth?
Knowledge:	Skills:
<ul style="list-style-type: none"> • Vocabulary: gonads, testes, seminiferous tubules, spermatogenesis, meiosis, diploid, haploid, epididymis, vas deferens, seminal vesicle, prostate gland, bulbourethral glands, semen, scrotum, sperm, penis, erection, orgasm, emission, gonadotropins, puberty, ovaries, primordial follicles, oogenesis, zygote, primary follicles, ovulation, uterine tubes, uterus, cervix, vagina, endometrium, myometrium, perimetrium, hymen, vulva, clitoris, vestibule, vestibular glands, vestibular bulb, estrogens, progesterone, ovarian cycle, corpus luteum, menstruation, sloughing, menopause, fertilization, pregnancy, zygote, embryo, fetus, cleavage, labor, prenatal period, postnatal period, neonatal period • 	<ul style="list-style-type: none"> • Describe the major functions of the male and female reproductive systems. • With respect to the gross anatomy, identify and describe the anatomy of the male and female reproductive system, including the gonads, ducts, accessory glands, associated support structures, and external genitalia. • Describe the pathway of the ovum from the ovary to the uterus. • Describe the pathway of sperm from the seminiferous tubules to the external urethral orifice of the penis. • Identify and describe the organs involved in semen production • Define secondary sex characteristics and describe their role in reproductive system function. • Describe the major events of embryonic and fetal

	<p>development.</p> <ul style="list-style-type: none"> • Describe the three stages of labor. • Explain the location of the following regions of the female uterus: cervix, fundus, body. • Define meiosis, oogenesis, and spermatogenesis. • Describe the influence of FSH and LH on ovarian function and testis functioning. • Describe the phases and controls of the menstrual cycle. • Identify the stages of reproduction from fertilization to birth. • List common reproductive system problems seen in adult and aging males and females.
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Assessment

Evaluation Criteria	Evidence of Understanding
<ul style="list-style-type: none"> • Homework • Quizzes • Tests • Projects • Inquiry Based Activities <p>Class discussion/ group work</p>	<ul style="list-style-type: none"> • Relate the general stages of meiosis to the specific processes of spermatogenesis and oogenesis. • Contrast the process and the final products of spermatogenesis and oogenesis. • Analyze graphs depicting the typical female monthly sexual cycle and correlate ovarian activity, hormonal changes, and uterine events. • Discuss the relationship between the location of the testes and sperm production. • Discuss the composition of semen and its role in sperm function. • Explain the hormonal events that initiate and regulate labor. • • Provide specific examples to demonstrate how the reproductive system responds to

	<p>maintain homeostasis in the body.</p> <ul style="list-style-type: none"> • Explain how the reproductive system relates to other body systems to maintain homeostasis. • Predict factors or situations affecting the reproductive system that could disrupt homeostasis. • Predict the types of problems that would occur in the body if the reproductive system could not maintain homeostasis.
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Materials and Resources

Source	Description of Use
<ul style="list-style-type: none"> • A&P text: Hole’s Essentials of Human Anatomy and Physiology, 9th edition • Human torso model • Inflatable lungs • A&P Coloring Book • Laboratory experiments • Mini-activities (e.g. simulations) • Worksheets • Computer-assisted instruction • Cooperative learning - problem solving • Videos • Library research 	<ul style="list-style-type: none"> • Materials necessary to complete performance tasks. • Direct teacher instruction • Demonstrations