Lakewood City Schools Science Course of Study – Eleventh and Twelfth Grade

ANATOMY & PHYSIOLOGY

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.

UNIT 1: LEVELS OF ORGANIZATION Chapters 1,2 and 23

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas **Science is a Way of Knowing** Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge.	▪ AP.LO.1: Hierarchy of organization Building on knowledge about cell structures and processes from middle school and Biology, this topic focuses on the increasing complexity of cells as they are organized into tissues. Several tissue types make up an organ. Several organs working together make up an organ system. All the organ systems interact and form the human body. ▪ AP.LO.2: Types of tissues The human body is comprised of four types of tissues: epithelial, connective, muscle and nervous. This topic includes a broad overview of the structure, function and location of each tissue type. Tissues can be studied as an independent unit or as they are encountered within each organ system. Investigations are used to understand and explain types of tissues in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. ▪ AP.LO.3: Homeostasis Homeostasis is a theme that is explored throughout the course. Homeostasis involves positive and negative feedback mechanisms that continuously monitor and adjust the body's	<u>Students will be able to:</u> a) define anatomy and physiology, and explain how they are related b) list and describe the major characteristics of life c) list and describe the major requirements of organisms d) define homeostasis and explain its importance to survival e) describe a homeostatic mechanism f) explain what is meant by levels of organization g) describe the locations of major body cavities h) list the organs located in each major body cavity i) name the major organ systems and list the organs associated with each j) describe the general functions of each organ system k) properly use the terms that describe relative positions, body sections, and body regions

Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes. **Scientific Knowledge is Open to Revision in Light of New Evidence** Science is not static. Science is constantly changing as we acquire more knowledge.	internal conditions (e.g., temperature regulation, pH, hormone regulation, blood pressure, hemostasis). At times, there can be a disruption (or disruptions) in the feedback loops, creating an imbalance. This homeostatic imbalance can result in a variety of conditions. ▪ AP.LO.4: Anatomical terminology Standard anatomical position is to be used as a reference point. Each area of the human body is identified by region. The features and structures of the body, relative to each other, are described by directional terms. The body and its organs can be divided by planes. The organs are located in cavities.	l) explain how the study of living material is dependent on the study of chemistry m) discuss the concept of pH n) list the major groups of inorganic substances that are common in cells o) describe the general roles played in cells by various types of organic substances p) explain how the structure of a cell membrane is related to its function q) distinguish between anabolic and catabolic metabolism r) explain how enzymes control metabolic processes s) explain how cellular respiration releases chemical energy t) describe the general metabolic pathways of carbohydrates, lipids, and proteins u) explain how metabolic pathways are regulated v) describe the general characteristics and functions of epithelial, connective, muscle and nervous tissue

UNIT 2: SUPPORT AND MOVEMENT Chapters 5-8 Integumentary System, Skeletal and Muscular Systems.

AP.SM: SUPPORT AND MOTION	Content elaboration	Instructional Objectives
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas **Science is a Way of Knowing** Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge. **Science is a Human Endeavor** Science has been, and continues to be, advanced by individuals of various races, genders,	AP.SM.1: Integumentary system The integumentary system consists of skin and accessory structures. The skin is composed of three layers: the epidermis, the dermis and the hypodermis (subcutaneous layer). The accessory structures can include sweat glands, sebaceous glands, arrector pili muscles, hair follicles and nails. Skin functions include protection, temperature regulation, excretion and sensory perception. These occur through the processes of perspiration, skin production and shedding, vitamin D synthesis and repair. Homeostatic imbalances are explored. These include, but are not limited to, burns, skin cancer, anhidrosis, acne, eczema or scleroderma. Investigations are used to understand and explain the integumentary system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. AP.SM.2: Skeletal system The skeletal system is composed of bones, cartilage, joints and ligaments. Bones make up most of the skeleton. There are four main cell types that compose bone tissue, each with a specific function: osteogenic cells, osteocytes, osteoblasts and osteoclasts. The microscopic anatomy of compact bone includes osteons. Bones are classified by their shape. The structure of a typical long bone can be explored. Specific bones of the skeleton can be studied by their subdivisions: the axial skeleton and the appendicular skeleton. Cartilage is found in areas of the nose, ears, ribs and joints. Joints can be classified by structure or by function. The general structure of synovial joints may be explored.	<u>Students will be able to:</u> a) describe the four major types of membranes b) describe the structure of various layers of skin c) list general functions of each layer of skin d) describe the accessory organs associated with the skin e) explain the functions of each accessory organ f) explain how the skin regulates body temperature g) summarize the factors that determine skin color h) classify bones according to their shapes and name an example from each group i) describe the general structure of a bone and list the functions of its parts j) describe the effects of sunlight, nutrition, hormonal secretions, and exercise on bone development k) discuss the major function of bones l) distinguish between the axial and appendicular skeletons, and name the major parts of each m) locate and identify the bones and the major features of the bones that comprise the skull, vertebral column, thoracic cage, pectoral girdle, upper limb, pelvic girdle and lower limb n) explain how joints can be classified according to the

ethnicities, languages, abilities, family backgrounds and incomes. **Scientific Knowledge is Open to Revision in Light of New Evidence** Science is not static. Science is constantly changing as we acquire more knowledge.	Ligaments connect bone to bone, stabilizing joints. The skeletal system provides support for the human body, protects soft organs, allows for movement due to attachment of muscles, stores minerals and fat and forms blood cells. Processes of the skeletal system include hematopoiesis, ossification and bone growth and remodeling. A comparison of male to female, juvenile to adult or human to other vertebrate skeletons may be explored. Homeostatic imbalances are explored. These include, but are not limited to, osteoporosis, malnutrition, fractures, anterior cruciate ligament (ACL) injuries and arthritis. Investigations are used to understand and explain the skeletal system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. AP.SM.3: Muscular system The muscular system consists of three types of muscle cells: skeletal, smooth and cardiac. The primary function of the muscular system is to contract, thereby, moving the body and internal fluids, maintaining posture, generating heat and stabilizing joints. Muscles are controlled voluntarily and/or involuntarily. Heart muscle cells are mononucleated, branched and striated. Intercalated disks are characteristic of cardiac muscle and aid in communication between cardiac muscle cells. Smooth muscle cells, found in the hollow organs and blood vessels, are mononucleated, spindle-shaped and nonstriated. Skeletal muscle cells, found attached to bones and skin, are multinucleated, cylindrical and striated. The muscles of the body can be studied by group, which include the muscles of the head, face and neck, the trunk and the upper and lower limbs.	type of tissue that binds the bone together o) describe the general structure of a synovial joint p) list six types of synovial joints and name an example of each type q) explain how skeletal muscles produce movements at joints and identify several types of joint movements r) name the major parts of a skeletal muscle fiber and describe the function of each part s) explain the major events that occur during muscle fiber contraction t) explain how energy is supplied to the muscle fiber contraction mechanism, how oxygen debt develops, and how a muscle may become fatigued u) distinguish between fast and slow muscles v) distinguish between a twitch and a sustained contraction w) describe how exercise affects skeletal muscles x) explain how various types of muscular contractions produce body movements and help maintain posture y) explain how the locations of skeletal muscles are related to the movements they produce and how muscles interact to produce such movements z) identify and describe the locations of the major skeletal muscles of each body region and describe the action of each muscle

Unit 3: Integration & Coordination Chapters 11-16 Nervous and Endocrine Systems

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas **Science is a Way of Knowing** Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge. **Science is a Human Endeavor** Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family	**CAP.IC.1:** Nervous system The nervous system consists of neurons and supporting cells that combine to form nerves, the spinal cord and the brain. The primary functions of the nervous system are sensation, integration and response. A comparison of the structures and functions of the central and peripheral nervous systems should be explored. The central nervous system is composed of the brain and spinal cord. The peripheral nervous system includes the remaining nervous tissue. A neuron consists of dendrites, a cell body and an axon. Neurons conduct electrical impulses along their membranes and at synapses. Brain cells can detect and sometimes respond to these impulses. Neuroglial cells help to support neural function. The brain consists of three major parts: the cerebrum, cerebellum and brainstem. The cerebrum is divided into lobes and hemispheres. Functions of the cerebrum that may be explored include voluntary muscle control, memory, sensory perception, emotions and speech. The cerebellum is primarily responsible for balance and coordination. The brainstem, a part of the autonomic nervous system, includes structural divisions that perform basic life functions such as breathing and heart rate. The spinal cord is a continuation of the brainstem. The spinal cord is a bundle of nerve tracts that transmits nerve signals between the brain and the body through electrical impulses. Nerves are bundles of neurons that transmit impulses between the peripheral and central nervous systems. The study of nerves can include sciatic, cranial and spinal nerves. Supporting structures of the central nervous system include the meninges and cerebrospinal fluid which protect the central nervous system.	<u>Students will be able to:</u> a) explain the general functions of the nervous system b) describe the general structure of a neuron c) name four types of neuroglial cells and describe the functions of each d) explain how an injured nerve fiber may regenerate e) explain how a nerve impulse is transmitted from one neuron to another f) explain how neurons are classified g) describe how nerve fibers in peripheral nerves are classified h) describe a reflex arc i) explain what is meant by reflex behavior j) describe the coverings of the brain and spinal cord k) describe the structure of the spinal cord and its major functions l) name the major parts of the brain and describe the functions of each m) describe the formation and function of cerebrospinal fluid n) list the major parts of the peripheral nervous system o) describe the structure of a peripheral nerve p) name the cranial nerves and list their major functions q) explain how spinal nerves are named r) explain the function of a spinal nerve

backgrounds and incomes. **Scientific Knowledge is Open to Revision in Light of New Evidence** Science is not static. Science is constantly changing as we acquire more knowledge.	Processes of the nervous system are action potential propagation, simple nerve pathways (reflex arc) and neurotransmitter function. Homeostatic imbalances are explored. These include, but are not limited to, the effects of drugs, mental illnesses, spinal injuries, concussions, meningitis and multiple sclerosis (MS). Investigations are used to understand and explain the nervous system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.IC.2:** Special senses • Sense of sight • Senses of hearing and balance • Senses of taste and smell The special senses consist of sight, hearing, balance, smell and taste. Each sense involves a network of feedback processes and consists of distinct structures. Sense of sight The eye provides visual environmental feedback and includes primary and accessory structures. Light enters through the pupil and is then focused by the lens onto the retina at the visual axis. The optic nerve transmits the electrical impulses to the brain where they are translated. The accessory structures provide lubrication, protection and support to the eye. Processes include stimulation of the photoreceptors (rods and cones) by light. Homeostatic imbalances are explored. These include, but are not limited to, certain types of blindness, conjunctivitis, glaucoma, astigmatism, hyperopia, myopia and cataracts. Investigations are used to understand and explain the sense of sight in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis (e.g., squid, falcon, hawks) communication skills and real-world applications. Senses of hearing and balance The ears respond to a range of sounds and provide a sense of equilibrium. The structures include those of the outer, middle and inner ear. Processes of hearing and balance should be explored including the perception of sound and spatial awareness. Homeostatic imbalances are explored. These include, but are not limited to, certain types of hearing loss, otitis media, lack of balance (e.g., vertigo), tinnitus, auditory processing, motion sickness and Meniere's syndrome. Investigations are used to understand and explain the senses of hearing and balance in a variety of inquiry and design scenarios that can incorporate evolutionary	s) describe the general characteristics of the autonomic nervous system t) distinguish between the sympathetic and parasympathetic divisions of the autonomic nervous system u) describe a sympathetic and a parasympathetic nerve pathway v) name the kinds of receptors and explain the function of each w) explain how receptors stimulate sensory impulses x) explain how a sensations produced y) distinguish between somatic and special senses z) describe the receptors associated with the senses of touch and pressure, temperature, and pain aa) describe how the sense of pain is produced bb) explain the importance of stretch receptors in muscles and tendons cc) explain the relationship between the senses of smell and taste dd) name the parts of the ear and explain the function each part ee) distinguish between static and dynamic equilibrium ff) name the parts of the eye and explain the function of each part gg) explain how light is refracted by the eye hh) explain how depth and distance are perceived ii) describe the visual nerve pathway jj) distinguish between endocrine and exocrine glands kk) describe how hormones can be classified according to their chemical composition

	concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. Senses of taste and smell The senses of taste and smell occur primarily in the oral and nasal cavities. The structure of taste buds and olfactory cells are the foundation of taste and smell. The location, structure and afferent pathways of taste and smell receptors should be addressed. Processes include activation of chemoreceptors and transmission of electrical impulses to the brain, where they are integrated. Homeostatic imbalances are explored. These include, but are not limited to, age-related sensitivities, taste preferences, anosmia and olfactory auras. Investigations are used to understand and explain the senses of taste and smell in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.IC.3:** Endocrine system The endocrine system is comprised of glands that secrete hormones resulting in a response in target cells or organs. Glands with their associated hormones may include pituitary, hypothalamus, thyroid, thymus, parathyroid, pineal, pancreas, adrenal, ovaries and testes. The endocrine system results in regulating metabolism, maintaining homeostasis, regulating growth and development, and controlling reproduction through hormonal release. The processes involved in the endocrine system should include a comparison of negative and positive feedback systems. Negative feedback examples can include regulation of blood glucose levels, calcium levels, blood pressure and temperature. Positive feedback examples can include oxytocin in childbirth and hemostasis. Homeostatic imbalances are explored. These include, but are not limited to, hyper- and hypo-functions of glands, diabetes (type I and type II), gigantism and dwarfism. Investigations are used to understand and explain the endocrine system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications.	ll) explain how steroid and nonsteroid hormones produce effects on target cells mm) discuss how negative feedback mechanisms regulate hormonal secretions nn) explain how the nervous system controls hormonal secretions oo) name and describe the locations of the major endocrine glands of the body, and list the hormones they secrete pp) describe the general functions of the hormones secreted by the endocrine glands

Unit 4: Transport Chapters 17-20 Heart, Blood, Immune System

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas **Science is a Way of Knowing** Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge. **Science is a Human Endeavor** Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	**AP.T.1**: Blood Blood is composed of plasma and the formed elements: red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes). The primary functions of blood are transportation, protection and regulation. Plasma, the most abundant component of blood, is the liquid portion that transports dissolved nutrients, waste, hormones, antibodies and proteins throughout the body. Red blood cells carry oxygen used during cellular processes throughout the body. White blood cells identify and protect the body against infectious disease and foreign cells. Platelets bind together when a blood vessel is damaged resulting in blood clot formation. The major ABO blood types, A, B, AB and O, are determined by the presence or absence of antigens on the surface of red blood cells. An additional antigen is present or absent on the surface of red blood cells determining Rh factor. Blood type antibodies are found in plasma. Processes related to blood include the production of blood cells and platelets, and hemostasis. Homeostatic imbalances are explored. These include, but are not limited to, sickle cell anemia, hemophilia, deep vein thrombosis, leukemia and lymphoma. Investigations are used to understand and explain blood in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.T.2**: Cardiovascular system The cardiovascular system consists of the heart and blood vessels. The heart is mostly comprised of cardiac muscle which is supplied with oxygenated blood by coronary arteries. The structure of the heart includes four chambers, four valves and major vessels leading to and from the heart. The flow of blood through the heart, pulmonary and	<u>Students will be able to:</u> a) describe general characteristics of blood and discuss major functions b) distinguish between various types of blood cells c) explain how blood cell counts are made and how they are used d) discuss life cycle of red blood cell e) explain how red blood cell production is controlled f) list major components of blood plasma and describe functions of each g) define hemostasis, and explain mechanisms that help achieve it h) review major steps in blood coagulation i) explain how coagulation can be prevented j) explain basis for blood typing k) describe how blood reactions may occur between fetal and maternal tissues l) name the organs of the cardiovascular system and discuss their functions m) name and describe the locations of major parts of the heart and discuss the function of each n) trace the pathway of the blood through the heart and the vessels of the coronary circulation o) compare the structures and functions of the major types of blood vessels p) describe the mechanisms that aid in returning venous blood to the heart

Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	systemic circuits should be explored. Blood flows from arteries, to arterioles, to capillaries, to venules, then to veins. In the capillaries, oxygen, nutrients, and chemical messengers diffuse out (leave) and carbon dioxide and other waste products diffuse in (enter). Veins have valves that keep the blood flowing toward the heart. The primary function of the cardiovascular system is the transport of oxygen, carbon dioxide, hormones, nutrients, waste products and chemical messengers. Processes involved in the cardiovascular system include the cardiac cycle and cardiac and conductive pathway which is measured by electrocardiograms and blood pressure. Homeostatic imbalances are explored. These include, but are not limited to, a variety of cardiovascular diseases and structural imperfections of the heart, valves and vessels. Examples include, but are not limited to, myocardial infarction, aneurysm, atherosclerosis, hypertrophic cardiomyopathy, hypo/hypertension and arrhythmias. Investigations are used to understand and explain the cardiovascular system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.T.3:** Lymphatic and immune system The lymphatic system includes lymph, lymphatic vessels, lymph nodes and the immune system. The lymphatic system has multiple, interrelated functions. They include the removal of fluid from tissues, absorption of large fatty acids in small intestines and transport of white blood cells to the lymph nodes. The immune system consists of white blood cells that destroy foreign antigens. Tissue fluid that has entered into lymphatic capillaries becomes lymph. Multiple lymphatic capillaries form lymphatic vessels. As lymph circulates through the body, it passes through multiple lymph nodes. These lymph nodes contain lymphocytes which destroy foreign antigens. Processes of the lymphatic system include defense through nonspecific and	q) explain how blood pressure is produced and controlled r) compare the pulmonary and systemic circuits of the cardiovascular system s) identify and locate the major arteries and veins of the two circuits t) describe the general functions of the lymphatic system u) describe the location of the major lymphatic pathways v) describe how tissue fluid and lymph form and explain the function of lymph w) explain how lymphatic circulation is maintained and describe the consequence of lymphatic obstruction x) describe a lymph node and its major functions y) describe the location of the major chains of lymph nodes z) discuss the functions of the thymus and spleen aa) distinguish between specific and nonspecific immunity, and provide examples of each bb) distinguish between active and passive immunity cc) explain how allergic reactions, tissue rejection reactions, and autoimmunity are related to immune mechanisms

	specific resistance. Examples of nonspecific resistance include mechanical barriers such as the skin, enzymes, species resistance and mucous membranes. In specific resistance, antibodies are produced that defend the body against foreign antigens. Memory cells are produced following an infection that allow for possible immunity against a specific antigen upon re-exposure. A comparison of primary versus secondary immune responses can be explored. Homeostatic imbalances are explored. These include, but are not limited to, autoimmune disorders, parasitic diseases, allergies, bacterial versus viral infections and ringworm. Vaccinations provide the body with either long-term protection or short-term protection against many pathogens. Investigations are used to understand and explain the lymphatic system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.R.1:** Reproductive system The reproductive system is comprised of internal and external organs and hormones. The ovaries and testes produce gametes that fuse to form a zygote, a single cell that develops into an embryo and eventually an adult. A comparison of male and female anatomy should be explored. The female body has the function of providing protection and nourishment for the developing fetus until birth. If all is successful, a new generation of offspring will occur. The processes of the reproductive system include oogenesis, spermatogenesis and fertilization. Additional processes can include lactation and menstruation. Homeostatic imbalances are explored. These include, but are not limited to, infertility, chromosomal disorders, endometriosis, cancer, Human Papillomavirus (HPV), and sexually transmitted diseases (STD's). Investigations are used to understand and explain the reproductive system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills	a) Identify the structures of the male reproductive system and the functions of each structure. b) Identify the structures of the female reproductive system and the functions of each structure. c) Explain the pathway of a gamete through each reproductive system. d) Compare the processes of oogenesis and spermatogenesis.

	and real-world applications. Note: At this level, a detailed description of embryological development is not required. The focus is on the structure and function of the reproductive organs.	

Unit 5: Absorption and Excretion Amerman Human Anatomy and Physiology Chapters 21-25 Respiratory, Urinary, Digestive Systems

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Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas **Science is a Way of Knowing** Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge. **Science is a Human Endeavor** Science has been, and continues to	**AP.AE.1:** Digestive system The digestive system consists of the gastrointestinal tract (alimentary canal) as well as various accessory organs including the teeth, tongue, salivary glands, liver, gallbladder and pancreas. The digestive system processes and supplies the molecules needed to sustain the living tissues within the body through the absorption of nutrients. Six major functions of the digestive system include secretion, ingestion, mechanical processing, enzymatic digestion, absorption and excretion. The lining of the digestive system protects surrounding tissues from the mechanical and enzymatic stresses of the digestive process. Processes of the digestive system include the mechanical and chemical breakdown of food into small molecules which are then absorbed by the digestive tract. Specific actions within the digestive system include mastication, peristalsis, segmentation and the release of hormones and enzymes necessary for digestion. The metabolic functions of the accessory organs play strategic roles in the breakdown of food products, the maintenance of glucose levels within the blood and the regulation of homeostasis in the body. Indigestible material is excreted as waste. Homeostatic imbalances are explored. These include, but are not limited to, conditions such as gallstones, heartburn, ulcers, dehydration, diarrhea, cirrhosis and cancers of the digestive system. Investigations are used to understand and explain the digestive system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.AE.2**: Respiratory system The respiratory system is comprised of the airways, lungs and	<u>Students will be able to:</u> a) name and describe the locations of the organs of the digestive system and their major parts b) describe the general functions of each digestive organ c) describe the structure of the wall of the alimentary canal d) explain how the contents of the alimentary canal are mixed and moved e) list the enzymes secreted by various digestive organs and gland and describe the function of each f) describe how digestive secretions are regulated g) explain how digestive reflexes control movement of material through the alimentary canal h) describe the mechanisms of swallowing, vomiting, and defecating i) explain how the products of digestion are absorbed j) list the general functions of the respiratory system k) name and describe the locations of the organs of the respiratory system l) describe the functions of each organ of the respiratory system m) explain how inspiration and expiration are accomplished

be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes. **Scientific Knowledge is Open to Revision in Light of New Evidence** Science is not static. Science is constantly changing as we acquire more knowledge.	diaphragm. The airways include the nasal and oral cavities, pharynx, larynx, trachea, bronchi, bronchioles and alveoli. The respiratory system transports and exchanges gases including oxygen and carbon dioxide. Processes involved in the respiratory system include respiration mechanics and gas exchange. Respiration mechanics is the process by which humans breathe and includes the movement of the diaphragm and pressure-volume relationships. Gas exchange refers to the diffusion of gas across the alveolar epithelium in the respiratory system and capillary endothelium of the cardiovascular system. Lung volumes and capacities can be measured using spirometry. Homeostatic imbalances are explored. These include, but are not limited to, asthma, chronic obstructive pulmonary disease (COPD), tuberculosis, cystic fibrosis and the effects of smoking and pollution. Investigations are used to understand and explain the respiratory system in a variety of inquiry and design scenarios that can incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications. **AP.AE.3: U**rinary system The urinary system is a regulatory system that helps maintain homeostasis. The structures of the urinary system include the kidneys, ureters, bladder and urethra. Each kidney consists of the renal cortex, medulla and renal pyramids. The functional unit of the kidney is the nephron. The renal pelvis is a funnel-shaped chamber that is connected to the ureter. The primary functions of the urinary system are excretion, elimination and regulation of blood volume and pressure. Processes of the urinary system include filtration, reabsorption and secretion, which occurs in the nephrons. Urine is normally a clear, yellow, sterile solution but the composition can vary slightly between individuals. Urinalysis is a diagnostic tool for detecting substances and conditions in the body. Antidiuretic hormone (ADH) and aldosterone hormones influence the volume and concentration of urine. Caffeine and alcohol act as diuretics and can lead to short or long-term kidney issues. Homeostatic imbalances are explored. These include, but are not limited to, urinary tract infections, kidney stones, nephritis and acute and chronic kidney disease. Investigations are used to understand and explain the urinary system in a variety of inquiry and design scenarios that can	n) name and define each of the respiratory air volumes and capacities o) list several nonrespiratory air movements and explain how each occurs p) describe the structure and function of the respiratory membrane q) explain how oxygen and carbon dioxide are transported in the blood r) name the organs of the urinary system and list their general functions s) describe the locations of the kidneys and the structure of a kidney t) list the functions of the kidneys u) trace the pathway of blood through the major vessels within a kidney v) describe a nephron and explain the functions of its major parts w) explain how glomerular filtrate is produced and describe its composition x) explain how various factors affect the rate of glomerular filtration and how this rate is regulated y) discuss the role of tubular reabsorption in urine formation z) define tubular secretion and explain its role in urine formation aa) describe the structure of the ureters, urinary bladder, and urethra bb) discuss the process of micturition and explain how it is controlled

	incorporate evolutionary concepts, scientific reasoning, comparative analysis, communication skills and real-world applications.	

Pacing

Levels of Organization (4 weeks)

- Introduction to Human Anatomy & Physiology
- Chemical Basis of Life
- Cells
- Cellular Metabolism
- Tissues

Support and Movement (8 weeks)

- Skin and the Integumentary System
- Skeletal System
- Joints of the Skeletal System
- Muscular System

Integration and Coordination (8 weeks)

- Nervous System – Basic Structure & Function
- Divisions of the Nervous System
- Somatic and Special Senses
- Endocrine System

Transport (5 weeks)

- Blood
- Cardiovascular system
- Lymphatic System and Immunity
- Absorption and Excretion (8 weeks)
- Digestive System
- Respiratory System
- Urinary System

Reproduction (2 weeks)

- Male and Female Reproductivity