

## HUMAN ANATOMY & PHYSIOLOGY

*Human Anatomy & Physiology* is a course in which students develop conceptual knowledge of the human body. Through instruction, including laboratory activities, students apply concepts associated with human anatomy and physiology. Studies will include the process of homeostasis and the essentials of human function at the level of genes, cells, tissues, and organ systems. Students are to understand the structure, organization, and function of the various components of the healthy human body in order to apply this knowledge in all health-related fields.

Students enrolled in this course will gain a basic understanding of the principles of atomic structure, bonding, molecules, and structural formulas, types of chemical reactions, principles of acids and bases, and molarity- as these topics relate to the human body. The course should include ample laboratory experiences that illustrate the application of the standards to the appropriate cells, tissues, organs, and organ systems. Dissection and simulation are both appropriate and necessary.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Safety, Inquiry and an introduction to HA&P	1 wk			
2. Cells, Fluids and Homeostasis	5wks			
3. Movement and Support in Humans	3weeks			
4. Structure and Function of the Nervous System		4wks		
5. Cardiothoracic organ systems		5wks	1wk	
6. Nutrition, Digestive and Urinary system			5 wks	
7. Immune Structure and Function			3wks	
8. Genetics and Structure, Function and Hormonal Control of Reproductive Systems				9 weeks

### QUARTER 1

### An introduction to Human Anatomy & Physiology

**Standard:**      **APa:** The student will demonstrate an understanding of how scientific inquiry and technological design, including Mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

- Indicators:**
- APa.1:** Generate hypotheses based on credible, accurate, relevant sources of scientific information.
  - APa.2:** Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
  - APa.3:** Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
  - APa.4:** Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
  - APa.5:** Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
  - APa.6:** Evaluate the results of a controlled scientific investigation

in terms of whether they refute or verify the hypothesis.

**APa.7:** Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).

**APa.8:** Compare the processes of scientific investigation and technological design.

**APa.9:** Use appropriate safety procedures when conducting investigations.

**Standard:**      **APb: ANATOMY AND PHYSIOLOGY: Relate structures of the human body to their function.**

- Indicators:**
- APb.1:** Explain the interrelatedness of Anatomy and Physiology.
  - APb.2:** Describe the subdivisions of Anatomy and Physiology.
  - APb.3:** Compare Cytology, Histology, and Morphology.
  - APb.4:** Explain the relationship between the various levels of structural organization of the body.
  - APb.5:** State the functional characteristics necessary for the maintenance of human life.
  - APb.6:** Describe the relationship between homeostasis and disease.
  - APb.7:** Use correct anatomical terminology to describe body directions, regions, and planes.
  - APb.8:** Name the major body cavities, their subdivisions, and the organs within.
  - APb.9:** State the function of serous membranes.

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**APb.10:** Investigate the various methods used in medical imaging.

**APb.11:** Practice the skills of auscultation, inspection, palpation, and percussion.

#### QUARTER 1

### **Cells , Fluids and Homeostasis**

*Students should understand that molecules make up the fabric of living cells, which, in turn, make up tissues. Students should explain how we control the salt content and volume of the fluid that surrounds the cells of our bodies and why this control is necessary. Students should be able to explain why it is necessary to control the pH of the fluids in our bodies. They should be able to define alkalosis and acidosis. Students should know the various sources of acid and the three ways in which the body defends itself against lethal changes of pH. Students should know the role of adhesion molecules, the classification of tissues, and the various cell types found in them.*

**Standard:**      **APd: OUTLINE CELLULAR STRUCTURES AND THEIR PROCESSES:**

**Indicators:**      **APd.1:** Relate the chemical composition of a plasma membrane to its function.

**APd.2:** Relate plasma membrane structure to cellular energy sources, and to the direction and mechanisms of substance transport.

**APd.3:** Define membrane potential.

**APd.4:** Explain how resting membrane potential is maintained.

**APd.5:** Discuss the role of the plasma membrane glycocalyx in cells' interaction with their environment.

**APd.6:** List several roles of membrane receptors.

**APd.7:** Describe the composition of the cytosol.

**APd.8:** List several types of inclusion.

**APd.9:** Compare the functions of lysosomes and peroxisomes.

**APd.10:** Describe the structure and function of cytoskeletal elements.

**APd.11:** Describe the chemical composition, structure, and function of the nuclear membrane, nucleolus, and chromatin.

**APd.12:** List the events in each phase of the life cycle of a cell.

**APd.13:** Discuss the process and significance of DNA replication.

**APd.14:** Explain the meaning of "genetic code".

**APd.15:** Discuss the roles of DNA, mRNA, tRNA, and rRNA in protein synthesis.

**APd.16:** Contrast triplets, codons, and anticodons.

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**APd.17:** Describe the composition of extracellular materials.

**APd.18:** Discuss theories which relate changes in cellular processes to changes in human development.

**APd.19:** Define: anaplasia, dysplasia, hypertrophy, mutation, necrosis, carcinogenesis.

**Standard:** **APe: CELL SPECIALIZATION: Associate Tissue Characteristics and arrangement within a given organ to its function.**

**Indicators:** **APe.1:** List several structural and functional characteristics of epithelial tissues.

**APe.2:** List the structural and functional characteristics of muscle tissues.

**APe.3:** List the structure and functions of the various types of connective tissues found in the body.

**APe.4:** Describe the structure and function of cutaneous, mucous, and serous membranes.

**APe.5:** Note the general characteristics of nervous tissue.

**APe.6:** Outline the process of tissue repair involved in normal healing of a superficial wound.

**APe.7:** Illustrate the embryonic derivation of each tissue class.

**APe.8:** Discuss tissue changes that occur as a result of human development.

**APe.9:** Define: autopsy, biopsy, pathology, adenoma, carcinoma, sarcoma.

**APe.10:** Use the microscope to examine various types of tissue.

**Standard:**

**APbb: FLUIDS AND ELECTROLYTE BALANCE: Describe the mechanisms by which Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, and Cl<sup>-</sup> ION concentrations are regulated to maintain electrolyte and acid-base balance in the body.**

**APbb.1:** Name the factors that determine body water content and describe the effect of each factor.

**APbb.2:** List the relative fluid volume and solute composition of the fluid compartments of the body.

**APbb.3:** Contrast the overall osmotic effects of electrolytes and non-electrolytes.

**APbb.4:** Review the routes by which water enters and leaves the body.

**APbb.5:** Describe factors that determine fluid shifts in the body.

**APbb.6:** Explain the importance of obligatory water losses.

**APbb.7:** Discuss possible causes and consequences of dehydration, hypotonic hydration, and edema.

**APbb.8:** Name the routes of electrolyte entry and loss from the body.

**APbb.9:** Explain the importance of ionic sodium in fluid and electrolyte balance of the body.

**APbb.10:** Distinguish between normal and abnormal electrolyte profiles.

**APbb.11:** Relate electrolyte and acid-base balance to normal cardiac functioning.

**APbb.12:** Describe the mechanisms that regulate sodium and water balance.

**APbb.13:** Explain how potassium, calcium, magnesium, and anion balance of plasma is regulated.

**APbb.14:** List important sources of acids in the body.

**APbb.15:** Explain how the three major chemical buffer systems of the body resist pH changes.

**APbb.16:** Describe the influence of the respiratory system on acid-base balance.

**APbb.17:** Describe how the kidneys regulate hydrogen and bicarbonate ion concentrations in the blood.

**APbb.18:** Distinguish between acidosis and alkalosis resulting from respiratory and metabolic factors.

**APbb.19:** Describe the importance of respiratory and renal compensations to acid-base balance.

**APbb.20:** Define: acidemia, alkalemia.

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**human anatomy and physiology and may be included at the instructor's discretion.**

**APbb.21:** Discuss why infants and the elderly are at greater risk for fluid and electrolyte imbalances than are young adults.

**APbb.22:** Discuss the chemistry of sports drinks. Why sports drinks are touted as best liquid for fluid and electrolyte imbalances in the human body.

**Standard:** **APc: CHEMISTRY OF THE HUMAN BODY: Relate chemical reactions to physiological processes and functions of the human body.**

**Indicators:** **APc.1:** Review the elements that form the bulk of body matter.

**APc.2:** Compare atoms, molecules, and cells.

**APc.3:** Identify three major types of chemical reactions that occur in the body.

**APc.4:** Explain the role of ATP in cell metabolism

**APc.5:** Explain why chemical reactions in the body are often reversible.

**APc.6:** Describe factors that affect chemical reaction rates.

**APc.7:** Compare the processes of osmosis, diffusion, filtration and give examples of their uses in the body.

**APc.8:** Explain the importance of water and salts to body homeostasis.

**APc.9:** Compare the structures and functions of carbohydrates, lipids, proteins, and nucleic acids.

**APc.10:** Discuss the role of dehydration, synthesis, and hydrolysis in the formation and break down of organic molecules.

**APc.11:** Compare the structure and function of DNA and RNA.

**APc.12:** Compare the structures and functions of neutral fats, phospholipids, and steroids in the body.

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**APc.13:** Name the four levels of protein structure.

**APc.14:** Describe the general mechanism of enzyme activity.

**APc.15:** Discuss the nature and significance of oxidation-reduction reactions in the body.

**APc.16:** Define: acidosis, alkalosis, ketosis, radiation sickness

**Standard:** **APf: THE INTEGUMENTARY SYSTEM: Correlate structure of the skin to its role in disease prevention and homeostasis.**

- Indicators:**
- APf.1:** Name the specific tissue types composing the epidermis and dermis.
  - APf.2:** Classify and describe the various types, locations, and functions of epithelia.
  - APf.3:** List the major layers of the skin and the function of each.
  - APf.4:** Describe the factors that normally contribute to skin color.
  - APf.5:** Discuss the effects of ultra violet rays on the skin.
  - APf.6:** Illustrate how the skin functions to help the body maintain homeostasis.
  - APf.7:** Compare the structure, composition, location, and function of the most common sweat and oil glands.
  - APf.8:** Describe the structure and functions of a hair follicle and its relationship to arrector pilli muscles.

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- APf.9:** Describe the distribution, growth, and replacement of hairs and the changing nature of hair during the life span.
- APf.10:** Describe the structure of nails.
- APf.11:** Associate changes in skin color with certain disease conditions.
- APf.12:** Differentiate between first, second, and third degree burns.
- APf.13:** Name the three major types of skin cancers.
- APf.14:** Summarize the changes that occur in the skin from birth to old age and the possible causes.
- APf.15:** Define: albinism, callus, boil, cold sore, decubitus, port wine stain, ringworm, vitiligo, psoriasis, impetigo, keloid, lesion, eschar, blister, athlete's foot, macular papular rashes, crusts, wheels, healing by first and second intention.

## **Movement and Support in Humans**

*Students know the physiology and structure of bones and skeletal muscle as they interact to provide movement and support of the human body. Students understand the chemical and microscopic structure of bone; its development, repair, turnover and growth; and its ability to heal when damaged. Students know that although the skeleton is made up of rigid bones, many joints allow for movement.*

**Standard:** **APg: SKELETAL SYSTEM: BONES AND SKELETAL TISSUES: Illustrate the structure of bones, how they form and are repaired.**

- Indicators:**
- APg.1:** Describe the process of bone formation. Describe the steps of fracture repair.
  - APg.2:** Compare the structure of each classification of bones and give an example of each.
  - APg.3:** Describe the gross anatomy of a typical long bone and flat bone.
  - APg.4:** Relate the role of nutrition to bone structure and bone mass throughout life.

**APg.5:** Indicate the locations and functions of red and yellow marrow, articular cartilage, periosteum, endosteum, haversian system, foramen, and fissures.

**APg.6:** Describe the organic and inorganic components of bone.

**APg.7:** Explain the location, characteristics, and functions of the major cartilage in the adult skeleton.

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**APg.8:** Explain the role of the kidneys in formation of bone. Contrast its role when the human body is in space.

**APg.9:** Contrast the disorders of bone remodeling seen in osteoporosis, osteomalacia, and Paget's disease.

**APg.10:** Relate the role of nutrition to bone structure and bone mass throughout life.

**APg.11:** Explain how hormonal controls and physical stress regulate bone remodeling.

**APg.12:** Define: bone spur, traction, osteomyelitis, osteosarcoma, pathological and other types of fractures.

**Standard:** **APh: THE SKELETAL SYSTEM-THE SKELETON: Link bone identity to its function.**

**Indicators:** **APh.1:** Describe the major parts and functions of the axial and appendicular skeletons.

**APh.2:** Identify the bones of the skull and their important markings.

**APh.3:** Compare the major functions of the cranium and the facial skeleton.

**APh.4:** Define the bony boundaries of the orbits, nasal cavity, and paranasal sinuses.

**APh.5:** Describe the structure and components of the vertebral column.

**APh.6:** State a common function of the spinal curvatures and the intervertebral discs.

**APh.7:** Compare the unique features of cervical, thoracic, and lumbar vertebrae.

**APh.8:** Identify the bones of the bony thorax.

**APh.9:** Differentiate true from false ribs.

**APh.10:** Relate the function of the pectoral girdle to its structure.

**APh.11:** Identify the bones of the upper limb and their important markings.

**APh.12:** Relate the structure of the coxal bones to the function of the pelvic girdle.

**APh.13:** Compare the anatomy and functions of the male and female pelvis.

**APh.14:** Identify the bones of the lower limb and their important markings.

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**APh.15:** Explain the effect of weight distribution on the three supporting arches of the foot.

**APh.16:** Discuss the significance of the fontanel.

**APh.17:** Describe how skeletal proportions change during childhood and adolescence.

**APh.18:** Compare the skeleton of an aged person with that of a young adult.

**APh.19:** Discuss how age-related skeletal changes may affect health.

**APh.20:** Define: bunion, chiropractor, clubfoot, laminectomy, orthopedist, pelvimetry, podiatrist, prolapsed disc, spina bifida, spinal fusion

**Standard:** **APi: THE SKELETAL SYSTEM - JOINTS: Differentiate between various joint types, their structure, and function.**

**Indicators:** **APi.1:** Define joint/articulation.

**APi.2:** Classify joints structurally and functionally.

**APi.3:** Describe the general structure and give an example of fibrous and cartilaginous joints.

**APi.4:** Describe the structural characteristics and stabilizing factors shared by all synovial joints.

**APi.5:** Compare the structures and functions of bursae and tendon sheaths.

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**APi.6:** Relate range of motion exercises to joint structure and function.

**APi.7:** Name six types of synovial joints and give an example of the movement of each.

**APi.8:** Describe the anatomical characteristics, movements, joint stability, and articulating bones of the elbow, knee, hip, and shoulder joints.

**APi.9:** Compare osteoarthritis, rheumatoid arthritis, and gouty arthritis with respect to the population affected, possible causes, structural joint changes, disease outcome, and therapy.

**APi.10:** Discuss the factors that promote and maintain joint homeostasis.

**APi.11:** Define: bursitis, congenital hip, rotator cuff injuries, joint replacement.

**Standard:** **APj: THE MUSCULAR SYSTEM - MUSCLES AND MUSCLE TISSUE: Illustrate the structure of muscle tissue and summarize the mechanics of contraction**

- Indicators:**
- APj.1:** Compare the basic types of muscle tissue.
  - APj.2:** Describe the gross structure of a skeletal muscle with respect to location and names of its connective tissue coverings and attachments.
  - APj.3:** Describe the microscopic structure and functional role of three types of skeletal muscle fibers.
  - APj.4:** Draw, label, and explain the function of a motor unit.
  - APj.5:** Explain how muscle fibers are stimulated to contract and what occurs during a muscle twitch.
  - APj.6:** Differentiate between isometric and isotonic contractions.
  - APj.7:** Describe three ways in which ATP is regenerated during skeletal muscle contraction.
  - APj.8:** Define oxygen debt and muscle fatigue and list the possible causes.
  - APj.9:** Compare the gross and microscopic anatomy of smooth muscle fibers to that of skeletal muscle fibers.
  - APj.10:** Compare the contractile mechanisms and the means of activation of skeletal and smooth muscles in the body.
  - APj.11:** Compare the effects of aerobic and resistance exercise on skeletal muscles and on other body systems.

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- APj.12:** List the factors that influence the force, velocity, and duration of a skeletal muscle contraction.
- APj.13:** Discuss the effects of steroids and nutritional supplements on muscle mass.
- APj.14:** Distinguish between single-unit and multi-unit smooth muscle structurally and functionally.
- APj.15:** Discuss the homeostatic interrelationship between the muscular system and other body systems.
- APj.16:** Define: calcium channel blockers, cramp, hernia, myalgia, RICE, spasm, strain, tetanus, myopathy, muscular dystrophy.
- APj.17:** Discuss the embryonic development of muscle tissues and the changes that occur in **skeletal** muscles with age.

**Standard:**      **APk: THE MUSCULAR SYSTEM: Identify the major muscles of the body and demonstrate their operation as a lever system.**

- Indicators:**
- APk.1:** Name and describe the advantage of the three types of lever systems.
  - APk.2:** Explain how a lever operating at a mechanical advantage differs from one operating at a mechanical disadvantage.
  - APk.3:** Describe how prime movers, antagonists, synergists, and fixators promote normal muscular function.
  - APk.4:** Categorize the muscles illustrating the criteria used for their classification.
  - APk.5:** Identify the major muscles of the body on a torso model.

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**APk.6:** Relate the power generated by muscles to the common patterns of fascicle arrangement.

**APk.7:** State the origin, insertion, and action of each major muscle of the body.

**APk.8:** Define: charley horse, shin splints, hamstring strain.

## QUARTER 2

### Structure and Function of the Nervous System

*Students should understand that the nervous system is divided into the peripheral nervous system and the central nervous system. Students recognize that nerve cells are the functional cellular units of the nervous system and that their activity calls for rapid transmission of information along their axons as well as an ability to network by "talking" to other nerve cells. Students should be familiar with the structure and functions of the subdivisions of the brain. They should also know that diseases of this part of the brain cause marked impairment of motor function. Students should know the cerebellum may play an important role in the learning of motor skills. Students should also be able to describe the structure and function of sensory receptors and their role in human survival.*

**Standard:**       **API: THE NERVOUS SYSTEM: Diagram the structure and describe the operation of the nerves.**

**Indicators:**   **API.1:** List the basic functions of the nervous system.

**API.2:** Explain the structural and functional divisions of the nervous system.

**API.3:** Describe the functions of satellite and Schwann cells in the peripheral nervous system.

**API.4:** Name and state the physiological role of each anatomical region of a neuron.

**API.5:** Explain how the myelin sheath is formed in the central and peripheral nervous systems and discuss its significance.

**API.6:** Distinguish in a general sense between serial and parallel processing.

**API.7:** Differentiate between a nerve and a tract and between a nucleus and a ganglion.

**API.8:** Explain how action potentials are generated and propagated along neurons.

**API.9:** Define absolute and relative refractory periods.

**API.10:** Contrast saltatory conduction with conduction along unmyelinated fibers.

**API.11:** Distinguish between the structure and mode of information transmission of electrical and chemical synapses.

**API.12:** Distinguish between excitatory and inhibitory post-synaptic potentials.

**API.13:** Describe how synaptic events are integrated and modified.

**API.14:** Define a neurotransmitter.

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**APL.15:** Name several classes of neurotransmitters.

**APL.16:** Describe common patterns of neuronal organization and processing.

**APL.17:** Describe neuronal differentiation.

**APL.18:** Classify neurons structurally and functionally.

**APL.19:** Describe the electrochemical basis of resting membrane potential.

**APL.20:** Compare graded and action potentials.

**APL.21:** Define: neurologist, neuropathy, neuropharmacology, neurotoxin, rabies, muscular sclerosis, ALS, myasthenia gravis.

**Standard:** **APm: THE CENTRAL NERVOUS SYSTEM: Explain the structure of the brain and demonstrate how it controls various functions within the body.**

**Indicators:** **APm.1:** List the components of the Central Nervous System.

**APm.2:** Name the major regions of the adult brain.

**APm.3:** Locate the ventricles of the brain on a model of the brain.

**APm.4:** List the major lobes, fissures, and functional areas of the cerebral cortex.

**APm.5:** Explain lateralization of hemisphere function.

**APm.6:** Name the major spinal cord tracts; their origin, termination, and function.

**APm.7:** State the general function of the basal nuclei.

**APm.8:** Describe the location and subdivisions of the diencephalon.

**APm.9:** Identify and state the general function of the three major regions of the brain stem.

**APm.10:** Describe the structure and function of the cerebellum.

**APm.11:** Explain the functions of the limbic system and the reticular formation.

**APm.12:** Describe how meninges, cerebrospinal fluid, and the blood-brain barrier protect the central nervous system.

**APm.13:** Describe the formation of cerebrospinal fluid.

**APm.14:** Trace the circulatory pathway of cerebrospinal fluid through the brain and spinal cord.

**APm.15:** Distinguish between a concussion and a contusion.

**APm.16:** Investigate the probable cause and signs and symptoms of cerebrovascular accidents, Alzheimer's disease, Huntington's disease, and Parkinson's disease.

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**APm.17:** Describe the embryonic development of the Central Nervous System.

**APm.18:** Describe the gross and microscopic structure of the spinal cord.

**APm.19:** Differentiate between commissures, association fibers, and projection fibers.

**APm.20:** Distinguish between flaccid and spastic paralysis and between paralysis and paresthesia.

**APm. 21:** Describe several techniques used to diagnose brain disorders.

**APm.22:** Name several maternal factors that can impair development of the nervous system in an embryo.

**APm.23:** Discuss how true senility and reversible senility differ in cause and consequence.

**APm.24:** Define: cordotomy, encephalopathy, microencephaly, myelitis, neuroses, psychoses, functional brain disorders, encephalitis, brain waves, electroencephlogram.

**APm.25:** Examine and dissect the brain of a mammal; cat, dog.

**Standard:** **APn. THE PERIPHERAL NERVOUS SYSTEM AND REFLEX ACTIVITY: Relate the components of the peripheral nervous system to reflex activity.**

**Indicators:** **APn.1:** List the components of the peripheral nervous system.

**APn.2:** Classify sensory receptors according to location, structure, and stimulus detected.

**APn.3:** Define receptor potentials and sensory adaptation.

**APn.4:** Compare afferent and efferent nerve pathways.

**APn.5:** Relate sensory, motor, and mixed nerves to afferent and efferent nerve pathways.

**APn.6:** Identify the general location of ganglia in the body.

**APn.7:** Describe the process of nerve fiber regeneration.

**APn.8:** Compare the motor endings of somatic and autonomic nerve fibers.

**APn.9:** Name the twelve pairs of cranial nerves.

**APn.10:** Name the body region and structures innervated by each.

**APn.11:** Describe the distribution and function of the peripheral nerves.

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**APn.12:** Describe the formation of a spinal nerve.

**APn.13:** Distinguish between spinal roots and rami.

**APn.14:** Describe the general distribution of the ventral and dorsal rami.

**APn.15:** Name the major plexuses, their origin sites, and the major nerves arising from each.

**APn.16:** Compare stretch, flexor, and crossed extensor reflexes.

**APn.17:** Define: analgesia, neuralgia, neuritis, shingles, paresthesia.

**APn.18:** Test the reflexes at the elbow, knee, and foot using a percussion hammer.

**APn.19:** Diagram and label a select reflex arc.

**Standard:** **APo. THE AUTONOMIC NERVOUS SYSTEM: Differentiate between the somatic and autonomic nervous systems and describe the types and levels of control for each.**

**Indicators:** **APo.1:** Compare the somatic and autonomic nervous systems relative to effectors, efferent pathways, and neurotransmitters released.

**APo.2:** Compare the general functions of the parasympathetic and sympathetic divisions.

**APo.3:** Identify the site of CNS origin, locations of ganglia, and general fiber pathways of the parasympathetic and sympathetic divisions.

**APo.4:** List the different types of cholinergic and adrenergic receptors.

**APo.5:** Discuss the clinical importance of drugs that mimic or inhibit adrenergic and cholinergic effects.

**APo.6:** State the effects of the parasympathetic and sympathetic divisions on the heart, blood vessels, gastrointestinal tract, lungs, adrenal medulla, and external genitalia.

**APo.7:** Discuss the developmental relationship between the segmented arrangement of peripheral nerves, skeletal muscles, and skin dermatomes.

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**APo.8:** Explain the relationship of some types of hypertension, Raynaud's disease, and the mass reflex reaction to disorders of autonomic functioning.

**APo.9:** Describe differences in the autonomic nervous system during human development.

**APo.10:** Discuss the interrelationships of the nervous system with the muscular, respiratory, digestive, and endocrine system.

**Standard:** **App: THE NERVOUS SYSTEM - NEURAL INTEGRATION: Describe structures and delineate the processes involved in perception.**

**Indicators:** **App.1:** List the three levels of sensory integration.

**App.2:** Describe the role of receptors in sensory processing.

- APp.3:** Compare specific and nonspecific ascending somatosensory pathways.
- APp.4:** Describe the main features of perceptual processing of sensory inputs.
- APp.5:** Describe the levels of the motor control hierarchy.
- APp.6:** Define central pattern generator and command neuron.
- APp.7:** Compare the roles of the direct and indirect systems in controlling motor activity.
- APp.8:** Explain the function of the cerebellum and basal nuclei in somatic sensory and motor integration.
- APp.9:** Distinguish between alpha, beta, theta, and delta waves as seen on an EKG strip.
- APp.10:** Compare the events and importance of slow-wave and REM sleep.
- APp.11:** Describe consciousness clinically.
- APp.12:** Discuss the term holistic processing in relation to human consciousness.
- APp.13:** Compare the stages and categories of memory.
- APp.14:** Describe the role of the major brain structures believed to be involved in fact and skill memories.

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**APp.15:** Describe symptoms of cerebellar and basal nuclear disease.

**APp.16:** Define: phantom pain, aphasia, dystonia.

**Standard:** **APq: THE SPECIAL SENSES: Diagram the anatomy of each of the five special senses and describe their functions.**

- Indicators:**
- APq.1:** Describe the location, structure, and afferent pathways of taste and smell receptors.
- APq.2:** Trace the pathway of light through the eye to the retina.
- APq.3:** Illustrate how light is focused for distant and close vision.
- APq.4:** Compare the roles of rods and cones in vision.
- APq.5:** Associate the response of the iris to the amount of light present.
- APq.6:** Trace the visual pathway to the optic cortex.
- APq.7:** Explain the process of visual processing.
- APq.8:** Explain the role of the organs of corti in the pitch, loudness, and localization of sounds.
- APq.9:** Explain how the balance organs of the semicircular canals and the vestibule help to maintain dynamic and static equilibrium.

- APq.10:** List possible causes and symptoms of otitis media, deafness, Meniere's syndrome, and motion sickness.
- APq.11:** Discuss the embryonic development of the special sense organs and life changes that occur in these organs.
- APq.12:** Explain how taste and smell receptors are activated and reach saturation.
- APq.13:** Describe the structure and function of accessory eye structures, eye tunics, lens, and humors of the eye.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

- APq.14:** Discuss the cause and consequences of astigmatism, cataract, glaucoma, hyperopia, myopia, and color blindness.
- APq.15:** Define: blepharitis, enucleation, exophthalmos, ophthalmology, optometrist, papilledema, otitis media, rubella, conductive and sensory hearing loss.
- APq.16:** Test visual acuity using a Snellen chart.
- APq.17:** Test the eye for colored blindness using the Ishihara test.
- APq.18:** Dissect the eye of a mammal.
- APq.19:** Use the ophthalmoscope to examine the retina.

#### QUARTERS 2/3

### The Cardiothoracic Systems

*Students understand the functions of blood including its role in essential protection to combat invading microorganisms, acute inflammation, and immune responses. Students recognize the anatomy and function of the heart and blood vessels. Students should understand the interrelationship between the heart and lungs. They should understand how breathing is controlled, how the mechanical aspects of the breathing processes occur, and how ventilation of the lungs changes in response to changes in blood oxygen, carbon dioxide, and pH. They should also understand that diseases of the cardiovascular system are a major cause of death in this country and, therefore, it is important to understand the normal physiology of the heart and blood vessels.*

**Standard:**      **APs :**      **BLOOD: Illustrate the mechanisms for the transport of nutrients, waste products, respiratory gases, and cells within the body.**

**Indicators:**      **APs.1:** Describe the composition and physical characteristics of whole blood; including a complete blood count.

**APs.2:** List six functions of blood.

**APs.3:** Discuss the composition and functions of plasma.

**APs.4:** Describe the structural characteristics, function, and production of erythrocytes.

**APs.5:** List the classes, structural characteristics, and functions of leukocytes.

**APs.6:** Describe the structure and function of platelets.

**APs.7:** List the steps in the process of agglutination.

**APs.8:** Describe the process of hemostasis in relation to blood.

**APs.9:** List the factors that limit clot formation and prevent undesirable clotting.

**APs.10:** Discuss blood types and their importance in transfusions.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APs.11:** Type blood using A-B antisera.

**APs.12:** Explain the mechanism of disorders caused by abnormalities of each of the formed elements.

**APs.13:** Discuss hemostatic disorders and their causes.

**APs.14:** Describe the function and the circumstances in which blood expanders might be used.

**APs.15:** Explain the importance of blood chemistry as a diagnostic tool.

**APs.16:** Discuss the implications of a bone marrow biopsy.

**APs.17:** Describe changes in the sites of blood production and in the type of hemoglobin produced after birth.

**APs.18:** Describe changes in the composition of the blood along the human development process.

**APs.19:** Relate the types and effects of anemia to physical signs and symptoms.

**APs.20:** Define: blood fraction, hematology, hematoma, septicemia, hypoxia, hepatitis, hemophilia, leukemia.

**Standard:** **APt.: THE CARDIOVASCULAR SYSTEM - THE HEART: Show the relationship between the physical properties of the heart and cardiac function.**

**Indicators:**

**APt.1:** Trace blood flow through the heart and lungs.

**APt.2:** Describe the location, function, and mode of operation for each heart valve.

**APt.3:** Describe the importance of the distribution of the major branches of the coronary arteries to normal heart function.

**APt.4:** Describe the structural and functional properties of cardiac muscle.

**APt. 5:** Discuss the importance of calcium ions to the contraction of cardiac muscle.

**APt.6:** Compare and contrast cardiac, smooth and skeletal muscle cells.

**APt.7:** Trace the electrical conduction in the heart beginning with the SA node.

**APt.8:** Relate normal heart sounds to specific events in the cardiac cycle.

**APt.9:** Describe the significance of the normal range of B/P and pulse.

**APt.16:** Identify various heart sounds using a stethoscope.

**APt.10:** Examine normal ECG tracings and relate to the cardiac cycle.

**APt.6:** Relate the stages of electrical conduction to the pumping action of the heart.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APt.11:** Examine ECG tracings for abnormalities.

**APt.12:** Discuss the interrelationship of stroke volume and heart rate in maintaining B/P.

**APt.13:** Explain the role of the autonomic nervous system in regulating cardiac output.

**APt.14:** Discuss the role of a diuretic in the management of hypertension.

**APt.15:** Compare a fetal heart with an adult heart.

**APt.17:** Discuss changes in heart function that occur as a result of human development.

**APt.18:** Define: arrhythmia, myocardial infarct, angina, congestive heart failure, hyper/hypotension, fibrillation.

**Standard:** **APu: THE CARDIOVASCULAR SYSTEM - BLOOD VESSELS: Associate the structure of blood vessels to the circulation of blood.**

**Indicators:** **APu.1:** State the functions of the three layers that typically form the wall of a blood vessel.

**APu.2:** Compare the anatomical and functional structure of arteries and veins.

**APu.3:** Define vasoconstriction and vasodilation.

**APu.4:** Discuss the relationship between blood flow, blood pressure, and resistance.

**APu.5:** Describe how blood pressure is regulated.

**APu.6:** Describe the significance of hypertension and hypotension to body function.

**APu.7:** Explain what and how specific organs regulate blood flow in the body.

**APu.8:** Trace blood through the systemic system.

**APu.9:** Trace the pathway of blood through the pulmonary circuit.

**APu.10:** Describe the general functions of the systemic circuit.

**APu.11:** Name the major arteries and veins in the systemic circulation.

**APu.12:** Trace the blood from various locations through the system to any other point.

**APu.13:** Describe the structures and special function of the cardiopulmonary gas exchange system.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APu.14:** Discuss circulatory shock and possible causes.

**APu.15:** Explain the significance of the factors involved in capillary dynamics.

**APu.16:** Explain how blood vessels develop in the fetus.

**APu.17:** Discuss the changes that often occur in blood vessels as a result of human development.

**APu.18:** Define: aneurysm, angiogram, phlebitis, phlebotomy, thrombophlebitis.

**Standard:** **APx: THE RESPIRATORY SYSTEM: Describe the structure and function of the respiratory system.**

**Indicators:** **APx.1:** Trace the pathway of air through the respiratory system.

**APx.2:** Describe the gross structure of the lungs and pleural coverings.

**APx.3:** Relate Boyle's law to inspiration and expiration.

**APx.4:** Discuss the role of the respiratory muscles and lung elasticity in effecting volume changes that cause air to flow into and out of the lungs.

**APx.5:** Explain the functional importance of the partial vacuum that exists in the intrapleural space.

**APx.6:** Describe several physical factors that influence pulmonary ventilation.

**APx.7:** Describe the exchange of oxygen and carbon dioxide across the alveolar membrane.

**APx.8:** Explain the differences in composition of atmospheric and alveolar air.

**APx.9:** Describe how oxygen and carbon dioxide are transported in the blood.

**APx.10:** Discuss how oxygen loading and unloading is affected by temperature, pH, pCO<sub>2</sub>, and pO<sub>2</sub>.

**APx.11:** Describe the neural controls of respiration.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APx.12:** Compare the influences of lung reflexes, volition, motions, arterial pH, and partial pressures of oxygen and carbon dioxide in arterial blood on respiratory rate and depth.

**APx.13:** Apply information gained from pulmonary function tests to diagnosis and treatment regimes.

**APx.14:** Compare the hyperpnea of exercise with involuntary hyperventilation.

**APx.15:** Describe the process and effects of acclimatization of high altitude.

**APx.16:** Differentiate between the causes and outcome of chronic bronchitis, asthma, tuberculosis, emphysema, and lung cancer.

**APx.17:** Use a spirometer to determine lung volumes.

**APx.18:** Describe the effects of primary and secondary tobacco smoke on the respiratory system.

**APx.19:** Trace the development of the respiratory system in an embryo.

**APx.20:** Describe normal changes that occur in the respiratory system from infancy to old age.

**APx.21:** Define: aspiration, bronchoscopy, cheyne-stokes respirations, orthopnea, tracheotomy, pulmonary embolism, endotracheal tube, otorhinolaryngology.

**APx.22:** Use a spirometer to measure tidal volume of the lung.

### QUARTER 3

## **Nutrition, Digestive and Urinary System**

*Students should understand the role of nutrition in the human body. Students should be able to explain why food is essential for life. Students should be able to apply the knowledge of the food pyramid in their lives. Students should also be able to produce the path of solid and liquid digestion from the mouth to the development of waste. Students should be able to define the digestive system and to state the structures, regulators, and functions of its primary and accessory structures and organs. Students should understand the microscopic and macroscopic anatomy of the renal system. Students should understand the function of the kidneys in relation to homeostatic control of bodily fluids, blood pressure, and erythrocyte production. They should understand micturition, the properties of urine and the physiological processes involved in the production of urine. Students should understand the importance of a high blood flow through the kidneys and the kidney's role in control of sugar, salts, and water. Students should understand the anatomy of the hepatic and splanchnic circulation and their relationship to the liver. Students should look to integrate learning from health education and personal fitness classes in this portion of the course.*

**Standard:** **APy: THE DIGESTIVE SYSTEM: Diagram the structure of the digestive system and outline its processes.**

**Indicators:** **APy.1:** Differentiate between organs of the alimentary canal and accessory digestive organs.

**APy.2:** Explain the major processes occurring during digestive system activity.

**APy.3:** Describe the location and function of the peritoneum and the peritoneal cavity.

**APy.4:** Discuss the tissue composition and the general function of each of the four layers of the alimentary tube.

**APy.5:** Illustrate the anatomy and explain the basic function of each organ and accessory organ of the alimentary canal.

**APy.6:** Describe the composition, functions, and regulation of saliva.

**APy.7:** Describe the mechanisms of chewing and swallowing.

**APy.8:** Identify the structural differences between the wall of the stomach and small intestine that enhance the digestive process in these regions.

**APy.9:** Compare the production and function of the components of gastric juice.

**APy.10:** Describe the function of local hormones produced by the small intestine.

**APy.11:** State the role of bile and pancreatic juice in digestion.

**APy.12:** Describe how entry of pancreatic juice and bile into the small intestine is regulated.

**APy.13:** Compare the enzymes of the digestive system as to location, substrates, and end products.

**APy.14:** Differentiate between the functions of each portion of the small and large intestines.

**APy.15:** Explain how secretion and motility are regulated throughout the digestive system.

**APy.16:** Observe chemical changes during enzymatic decomposition in a laboratory setting.

**APy.17:** Describe the embryonic development of the digestive system.

**APy.18:** Define: ascites, dysphagia, endoscopy, enteritis, pyloric stenosis, proctocolony, bulimia, esophageal reflux, ulcerative colitis, occult blood.

**Standard:** **APz: NUTRITION, METABOLISM, AND BODY TEMPERATURE REGULATION: Relate nutrients and metabolism to homeostasis.**

**Indicators:** **APz.1:** Define nutrient, essential nutrient, and calorie.

**APz.2:** Recall important dietary sources and the main cellular uses of each.

**APz.3:** Distinguish between nutritionally complete and incomplete proteins.

**APz.4:** List possible causes of positive and negative nitrogen balance.

**APz.5:** Distinguish between fat and water soluble vitamins.

**APz.6:** Describe possible consequences of vitamin deficiency or excess.

**APz.7:** Describe how essential minerals are utilized in the body.

**APz.8:** Explain the relationship between metabolism, anabolism, and catabolism.

**APz.9:** Compare substrate level phosphorylation and oxidative phosphorylation.

**APz.10:** Describe oxidation of glucose in body cells.

**APz.11:** Discuss important events and products of glycolysis, the Krebs cycle, and the electron transport chain.

**APz.12:** Differentiate between glycogenesis, glycogenolysis, and gluconeogenesis.

**APz.13:** Describe the process and products of fatty acids and amino acids oxidation.

**APz.14:** Describe the process of protein synthesis in body cells.

**APz.15:** Discuss the pathways by which substances in the carbohydrate-fat pools can be interconverted.

**APz.16:** Differentiate between LDLs and HDLs relative to their structures and major roles in the body.

**APz.17:** Explain the regulation of absorptive and post-absorptive states.

**APz.18:** List several metabolic functions of the liver.

**APz.19:** Compare the caloric content of carbohydrates, fats, and proteins and relate their consumption to weight control.

**APz.20:** Compare basal metabolic rate and total metabolic rate.

**APz.21:** Name several factors that influence metabolic rate.

**APz.22:** Discuss some current theories of food intake regulation.

**APz.23:** Describe the common mechanisms that regulate heat production/retention and loss from the body.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APz.24:** Describe the effects of dietary and fluid deficiency on fetal development.

**APz.25:** Discuss factors that contribute to nutritional deficiencies in the elderly.

**APz.26:** Define: appetite, hyper/hypothermia, ideal weight, skin-fold test.

**Standard:** **APaa: URINARY SYSTEM: Discuss the process by which the urinary system maintains balance in the body.**

**Indicators:** **APaa.1:** Describe the gross anatomy of the components of the urinary system.

**APaa.2:** Dissect the cortex and pelvis of the kidney.

**APaa.3:** Use a microscope to examine the nephron of the kidney.

**APaa.4:** Trace the blood supply through the kidney.

**APaa.5:** List several kidney functions that help maintain body homeostasis.

**APaa.6:** Use dipsticks to test urine for pH, glucose, ketones, and protein.

**APaa.7:** Describe factors that influence urine concentration.

**APaa.8:** List the normal physical properties and chemical values of urine.

**APaa.9:** Trace fluid from ingestion to release as waste

**APaa.10:** Compare the course, length, and functions of the male urethra with those of the female.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APaa.11:** Explain the micturition reflex.

**APaa.12:** Describe the embryonic development of the organs of the urinary system.

**APaa.13:** Discuss changes in the urinary system that occur as a result of human development.

**APaa.14:** Explain the process by which diuretics increase urinary output.

**APaa.15:** Discuss the use of dialysis in the treatment of renal failure.

**APaa.16:** Explain the process by which the filtrate is changed as it moves through the nephron.

**APaa.17:** Explain the role of aldosterone and atrial natriuretic peptide in sodium and water balance.

**APaa.18:** Define: cystocele, enuresis, cystoscopy, urologist, diabetes insipidus, albuminuria, urinary tract infection, glomerulonephritis, proteinuria.

### QUARTER 3

## Immune Mechanisms

*Students should know that pathogens attempt to invade our bodies to take advantage of our nutrients and our protein synthetic machinery. Students should understand the various lines of defense including the two immune systems that save us from certain death by infection. Students should know the cellular and non-cellular components of the innate, natural, non-specific immune system and the specific, acquired immune system. Students should understand the role of the lymphatic system in the body's defense against marauding pathogens. Students should also understand that many of the cells of the immune system are formed, reside in, are processed in, or travel within and through the structures of the lymphatic system. Students should understand these structures, classify them, and know their location.*

**Standard:**      **APv: THE LYMPHATIC SYSTEM: Illustrate the role of the lymphatic system in the body's preservation of proteins and defenses against pathogens.**

**Indicators:**    **APv.1:** Describe the structure and distribution of lymphatic vessels.

**APv.2:** State the important functions of lymphatic vessels.

**APv.3:** Name the major lymphoid organs.

**APv.4:** Identify the source of lymph and the process of lymph transport.

**APv.5:** Describe the general locations, histological structure, and functions of lymph nodes.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APv.6:** Describe the basic structure and cell population of lymphoid tissue.

**APv.7:** Compare other lymphoid organs of the body with lymph nodes; structurally and functionally.

**APv.8:** Define: elephantiasis, Hodgkin's disease, lymphadenopathy, mononucleosis, splenomegaly, tonsillitis, lymphoma.

**Standard:**      **APw: NONSPECIFIC BODY DEFENSES AND IMMUNITY: Compare cellular and chemical defenses that protect the body from disease.**

**Indicator:**     **APw.1:** Describe the surface membrane barriers and their protective functions.

**APw.2:** Relate the events of the inflammatory process and the role of inflammatory chemicals to tissue injury.

**APw.3:** Describe the function of the body's antimicrobial substances.

**APw.4:** Discuss how fever helps protect the body against invading pathogens.

**APw.5:** Explain how an antigen affects the immune system.

**APw.6:** Define complete antigen, hapten, and antigenic determinants.

**APw.7:** Compare and contrast the origin, maturation process, and general function of B and T lymphocytes.

**APw.8:** Describe the role of macrophages and other phagocytes in immunity.

**APw.9:** Define immune competence and self-tolerance.

**APw.10:** Explain the “wheal and flare” response

**APw.11:** Describe the process of clonal selection of a B cell.

**APw.12:** Compare active and passive humoral immunity.

**APw.13:** Name and describe the function of the five classes of antibodies.

**APw.14:** Discuss the development and clinical uses of monoclonal antibodies.

**APw.15:** Define cell-mediated immunity.

**APw.16:** Describe the process of activation and clonal selection of T cells.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APw.17:** Investigate lab tests that are done prior to an organ transplant to prevent tissue rejection.

**APw.18:** Discuss the factors involved in autoimmune disease.

**APw.19:** Describe changes in immunity that occur during the human development process.

**APw.20:** Describe the process of scab formation when the skin has been damaged.

**APw.21:** Discuss the role of the nervous system in regulating the immune response.

**APw.22:** How is scab formation different for diabetics? How is the scab formation process different for people who have suffered severe burns?

**APw.23:** Discuss why the treatment for a cold is different than the treatment for the flu.

**APw.24:** Define: congenital thymic aplasia, eczema, immunization, immunopathology, systemic lupus erythematosus, allergies, HIV/AIDS, antiphylactic shock.

#### QUARTER 4

### **Genetics and Structure, Function and Hormonal Control of Reproductive Systems**

*Students understand the structure and function of the endocrine system in relation to digestion and metabolism, homeostasis, survival, growth, development, and reproduction. Students will be able to identify the structure and function of human male/female development.. Students will be introduced to Mendelian genetics and should be able to accurately predict an outcome of a dihybrid cross using a Punnett square.*

**Standard:**        **Apr: THE ENDOCRINE SYSTEM: Correlate the structure and operation of the endocrine system to the nervous system and the maintenance of homeostasis.**

**Indicators:**     **APr.1:** Discuss the important differences between hormonal and neural controls of body functioning.

**APr.2:** Distinguish between circulating hormones and local hormones.

- APr.3:** Describe how hormones are classified chemically.
- APr.4:** Describe the mechanisms by which hormones effect targeted tissues.
- APr.5:** Explain how hormone release is regulated by a feedback mechanism.
- APr.6:** Relate the response of the nervous and endocrine systems in the fight or flight response.
- APr.7:** Describe the structural and functional relationships between the hypothalamus and the pituitary gland.
- APr.8:** Describe the chief effects of adenohypophyseal hormones.
- APr.9:** Describe the effects of the two hormones released by the neurohypophysis.
- APr.10:** Describe the effects of the two groups of hormones produced by the thyroid gland.
- APr.11:** Follow the process of thyroxine formation and release.
- APr.12:** Describe the functions of the parathyroid hormone.
- APr.13:** List the physiological effects of the hormones produced by the cortical and medullary regions of the adrenal gland.
- APr.14:** Compare the effects of the two major pancreatic hormones.
- APr.15:** Describe the functions of the hormones produced by the testes and ovaries.
- APr.16:** Discuss the significance of thymic hormones in the operation of the immune system.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

- APr.17:** Name a hormone produced by the heart.
- APr.18:** Discuss the hormonal functions of the placenta, kidney, and skin.
- APr.19:** Describe the effect of human development on endocrine system functions.
- APr.20:** Discuss the interrelatedness of the endocrine system with the nervous and reproductive systems.
- APr.21:** Define: hirsutism, hypophysectomy, prolactinoma, dwarfism, thyroid storm, exophthalmia.

**Standard:** **APcc: THE REPRODUCTIVE SYSTEM: Describe the structure and function of the reproductive organs.**

- Indicators:** **APcc.1:** Describe the structure and function of the components of the male reproductive system.
- APcc.2:** Discuss the production and functions of semen.
- APcc.3:** Outline the events of meiosis.
- APcc.4:** Outline the events of spermatogenesis.
- APcc.5:** Discuss hormonal regulation of testicular function and the physiological effects of testosterone on male reproductive anatomy.

**APcc.6:** Describe the structure and function of the components of the female reproductive system.

**APcc.7:** Discuss the structure and function of the mammary glands.

**APcc.8:** Outline the events of oogenesis.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APcc.9:** Describe the phases of the female sexual response.

**APcc.10:** Describe the phases of the male sexual response.

**APcc.11:** Discuss the cellular determination of sex and prenatal development of male and female structures.

**APcc.12:** Discuss sexual maturation through the life cycle.

**APcc.13:** Define: dysmenorrhea, endometriosis, gynecology, hysterectomy, inguinal hernia, laparoscopy, orchiditis, ovarian cyst, gynecomastia, prostatic cancer, benign hyperstatic hypertrophy, testicular cancer.

**APcc.14:** Examine slides of testicular and ovarian tissue to identify graffian follicles and seminiferous tubules.

**Standard:** **APdd: THE REPRODUCTIVE SYSTEM: PREGNANCY AND HUMAN DEVELOPMENT: Outline the important events of gestation, delivery, and postpartum period.**

**Indicators:** **APdd.1:** Explain the process of fertilization.

**APdd.2:** Describe the role of hormones in the maintenance of pregnancy.

**APdd.3:** Describe the development of the zygote prior to implantation.

**APdd.4:** Describe the processes of implantation and placenta formation.

**APdd.5:** Name the functions of the placenta.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APdd.6:** Describe the unique features of fetal circulation.

**APdd.8:** Describe the major events of fetal development.

**APdd.9:** Discuss the effects of pregnancy on maternal metabolism and body systems.

**APdd.10:** Review the initiation and stages of labor.

**APdd.11:** Outline the events leading to the first breath of a newborn.

**APdd.12:** Describe the changes that occur in fetal circulation after birth.

**APdd.13:** Describe changes within the breast before and during lactation.

**APdd.14:** Discuss the maternal and infant responses to breast feeding.

**APdd.15:** Describe the formation, location, and function of the embryonic membranes.

**APdd.16:** Explain the important roles of the three primary germ layers in organogenesis

**APdd.17:** Define: abortion, eclampsia, ectopic pregnancy, hydatid mole, placenta abruption, placenta previa, physiological jaundice, ultrasonography, mastitis, tubal ligation, vasectomy.

**Standard:** **APee: HEREDITY: Relate the role of genetics to heredity.**

**Indicators:** **APee.1:** Describe events that lead to genetic variability of gametes.

**APee.2:** Compare dominant-recessive inheritance with incomplete dominance and co-dominance.

**APee.3:** Outline the mechanism of sex-linked inheritance.

**APee.4:** Manipulate a monohybrid and dihybrid crosses using a Punnett square.

**APee.5:** Discuss how polygene inheritance differs from that resulting from the action of a single pair of alleles.

**APee.6:** Illustrate how gene expression may be modified by environmental factors.

**Indicators provided after this point in the standard are not considered essential for this course, but they can help to provide a deeper understanding of the human anatomy and physiology and may be included at the instructor's discretion.**

**APee.7:** Discuss how genomic imprinting and mitochondrial inheritance differs from classical Mendelian inheritance.

**APee.8:** Identify several techniques used to determine or predict genetic diseases.

**APee.9:** Discuss how advances in genetic engineering have affected gene therapy.

**APee.10:** Define: deletion, mutation, nondisjunction, Down's syndrome, trisomy.

## Virtual Anatomy and Physiology Resources

1. Gray's *Anatomy of the Human Body*, available online at <http://www.bartleby.com/107/>
2. The Heart: An Online Exploration by The Franklin Institute Resources for Science Learning, available online at <http://www.fi.edu/biosci/index.html>
3. Howard Hughes Medical Institute Virtual Labs, available online at <http://www.hhmi.org/biointeractive/vlabs/index.html>
4. The Virtual Body by Medtropolis, available online at <http://www.medtropolis.com/VBody.asp>
5. Atlas of the Body by the American Medical Association, available online at <http://www.ama-assn.org/ama/pub/category/7140.html>
6. Human Anatomy: Organs by the BBC Science & Nature, available online at [http://www.bbc.co.uk/science/humanbody/body/factfiles/organs\\_anatomy.shtml](http://www.bbc.co.uk/science/humanbody/body/factfiles/organs_anatomy.shtml)
7. Human Anatomy Online by MyHealthScore.com, available online at <http://www.innerbody.com/htm/body.html>
8. Federal Nutrition guidelines, available online at <http://www.mypyramid.gov/>
9. Human Reproduction Problem Set by The University of Arizona Biology Project, available online at [http://www.biology.arizona.edu/human\\_bio/problem\\_sets/Human\\_Reproduction/human\\_reproduction.html](http://www.biology.arizona.edu/human_bio/problem_sets/Human_Reproduction/human_reproduction.html)
10. Life's Greatest Miracle by NOVA/PBS, available online at <http://www.pbs.org/wgbh/nova/miracle/program.html>