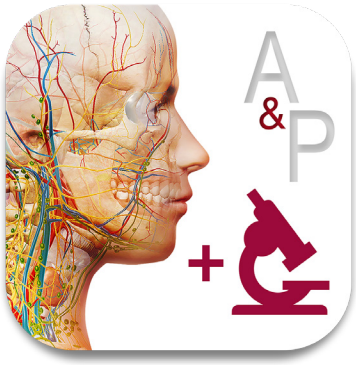
Anatomy & Physiology 2019

Instructor's Manual

VISIBLE BODY®

Contents

Learning Objectives for Anatomy & Physiology



Anatomy & Physiology by Visible Body contains 12 units. Below is a listing of the units, including the chapters within them and their associated learning objectives.

1. Cells and Tissue

This unit contains chapters on Cell Structure and Function, Cell Life Cycle, and Tissues. At the conclusion of this unit, students will be able to:

- Identify different types of cells and describe their functions.
- Identify the parts of a cell.
- Describe the structure and functions of the plasma membrane.
- Explain how substances cross the plasma membrane.
- Identify the organelles of a typical cell and describe their functions.
- Describe the process of osmosis.
- Describe the process of cellular respiration.
- Explain how DNA is used to synthesize proteins.
- Explain how the process of replication allows cells to multiply.
- Describe the cell life cycle.
- Describe the processes of mitosis and meiosis.
- Describe the production and role of gametes.
- Identify the major tissue types and locate examples of each in the body.
- Describe the structure and locations of epithelial tissue.
- Describe the structure and locations of connective tissue.
- Describe the structure and locations of muscle tissue.
- Describe the structure and locations of nervous tissue.
- Describe the process of tissue repair.
- Explain how tissue repair can result in scarring.

2. Integumentary System

This unit contains a chapter on the Integumentary System. At the conclusion of this unit, students will be able to:

- Identify the major components of the integumentary system and describe their functions.
- Identify the major structures of the skin and describe their functions.
- Identify the four types of epidermal cells and describe their functions.
- Describe the role of dermal circulation.
- Explain how vitamin D is synthesized.
- Describe the sensory innervation of the skin.
- Describe the structure, functions, and growth process of hair.
- Describe the structure and growth process of nails.
- Explain why the mammary glands are considered specialized integumentary glands.
- Describe the process of tissue repair and explain why scarring occurs.

3. Skeletal System and Joints

This unit contains chapters on Types of Bones, Bone Tissue, Axial Skeleton, Appendicular Skeleton, and Joints. At the conclusion of this unit, students will be able to:

- Identify the major components of the skeletal system and describe their functions.
- Describe the different types of bones and provide an example of each type.
- Identify the parts of a long bone.
- Identify the major types of bone cells and describe their functions.
- Describe the structure and function of compact and spongy bone tissue.
- Describe the role of calcium in the skeletal system.
- Describe the processes of long and flat bone formation.
- Describe the internal structure of a long bone.
- Describe the components and functions of yellow and red bone marrow.
- Describe the process of bone repair.
- Identify the different types of fractures.
- Describe how bone tissue changes with advancing age.
- Locate and identify the structures that make up the axial skeleton.
- Locate and identify the bones and major landmarks of the skull.
- Describe the structure and function of skull sutures and fontanelles.
- Locate and identify the auditory ossicles.
- Locate and identify the bones, major landmarks, and ligaments of the vertebral column.
- Describe the cross-sectional structure of a vertebra.
- Locate and identify bones of the thoracic cage.

3. Skeletal System and Joints *(continued)*

- Locate and identify the structures that make up the appendicular skeleton.
- Locate and identify the bones and major landmarks of the shoulder girdle.
- Describe how some bones are stabilized by muscles.
- Locate and identify the bones and major landmarks of the upper limb.
- Describe the structure of the carpal tunnel and its role in carpal tunnel syndrome.
- Locate and identify the bones and major landmarks of the pelvic girdle.
- Describe the differences between the male pelvis and female pelvis, and explain why these differences exist.
- Locate and identify the bones and major landmarks of the lower limb.
- Describe the structure and function of the arches of the foot.
- Identify and describe the different types of joints, explain their functions, and provide an example of each type.
- Identify and describe the six major types of synovial joints, and provide an example of each type.
- Explain how ligaments reinforce joints and contribute to movement.
- Describe how joints can degenerate with advancing age.

4. Muscle Tissue and Muscular System

This unit contains chapters on Skeletal Muscle Tissue, Smooth and Cardiac Muscle Tissue, and the Muscular System. At the conclusion of this unit, students will be able to:

- Identify the three types of muscle and describe the muscular system's functions.
- Describe the location and function of skeletal muscles.
- Locate and identify smooth muscle in the body.
- Locate and identify the blood vessels and conduction system that supply and innervate cardiac muscle.
- Describe the distinguishing features of each of the three types of muscle.
- Locate and identify the major skeletal muscle regions of the body.
- Describe the blood supply and innervation of skeletal muscles.
- Describe the microscopic structure of skeletal muscle tissue.
- Explain how an impulse generated by the central nervous system results in the contraction of a skeletal muscle.
- Locate and identify smooth muscle in the body.
- Describe the location and function of smooth muscle.
- Locate and identify smooth muscle layers of the stomach.
- Locate and identify the blood vessels and conduction system that supply and innervate cardiac muscle.
- Describe the location and function of cardiac muscle.
- Describe the roles of agonists and antagonists in muscle movement and identify at least one example of paired muscles that oppose each other's action.
- Explain the meaning of the terms *insertion* and *origin* and describe how skeletal muscles attach to the bony skeleton.
- Explain how the skeletal and muscular systems work together to produce leverage and identify and describe examples of first, second, and third-class levers in the body.
- Locate, identify, and describe the functions of the following muscles or muscle groups.
  - Facial expression.
  - Extrinsic eye.
  - Mastication.
  - Tongue.
  - Suprahyoid.
  - Infrahyoid.
  - Vertebral column.
  - Abdomen.
  - Pelvis.
  - Diaphragm and intercostals.
  - Shoulder girdle.
  - Arm.
  - Rotator cuff.
  - Elbow flexors and extensors.
  - Forearm pronators and supinators.
  - Wrist/hand flexors and extensors.
  - Thenar, hypothenar, midpalmar.
  - Iliopsoas.
  - Gluteal.
  - Lateral rotators.
  - Anterior thigh.
  - Medial thigh.
  - Posterior thigh.
  - Anterior lower leg.
  - Lateral lower leg.
  - Posterior lower leg.
  - Foot, dorsum.
  - Foot, plantar layers.

5. Nervous System and Special Senses

This unit contains chapters on Nervous Tissue, Spinal Cord and Spinal Nerves, Brain, Cranial Nerves, Somatic and Autonomic Nervous Systems, and Special Senses. At the conclusion of this unit, students will be able to:

- Identify the major components of the nervous system and describe their functions.
- Describe the composition and location of nervous tissue.
- Locate and identify the parts of a neuron.
- Describe the structural types of neurons.
- Describe the types of neuroglia and their functions.
- Explain how resting and action potentials contribute to nerve function.
- Describe the process of neurotransmission.
- Identify major neurotransmitters and describe their functions.
- Locate and identify the spinal cord and its meninges.
- Locate and identify the cross-sectional structures of the spinal column.
- Describe the distribution and function of gray and white matter in the spinal cord.
- Explain how sensory signals and motor commands are relayed through the spinal cord and spinal nerves.
- Locate and identify the spinal nerves and nerve plexuses.
- Explain what a dermatome is and identify skin regions innervated by each spinal nerve.
- Locate and identify major spinal nerves and structures they innervate.
- Describe the somatic reflex arc.
- Locate and identify anatomical regions of the brain.
- Locate and identify anatomical structures that surround and protect the brain.
- Identify the ventricles of the brain and describe their functions.
- Locate and identify blood vessels that supply the brain.
- Identify structures of the brain stem and describe their functions.
- Identify the parts of the cerebellum and describe their functions.
- Identify structures of the diencephalon and describe their functions.
- Identify structures of the limbic system and describe their functions.
- Identify structures of the cerebrum and describe their functions.
- Locate and identify the anatomical features of the cerebrum.
- Locate and identify functional regions of the cerebral cortex.
- Locate and identify the 12 paired cranial nerves by name and number.
- Locate and identify the cranial nerves that transmit special sensory signals.
- Locate and identify the cranial nerves that transmit motor signals.
- Locate and identify the cranial nerves that transmit both sensory and motor signals.
- Describe the pathway and functions of each cranial nerve.
- Describe the functions of the somatic and autonomic nervous systems.
- Identify structures of somatic sensation and describe their functions.
- Describe the motor functions of the somatic nervous system.
- Describe the sensory and motor pathways of the somatic nervous system.
- Describe the roles of the basal ganglia and cerebellum in somatic nervous system function.
- Describe the functions of the somatic and autonomic nervous systems.
- Describe the structure of the autonomic nervous system.
- Describe the roles of the sympathetic and parasympathetic nervous systems.
- Locate and identify anatomical structures of the special senses.
- Describe the process of olfaction.
- Identify cranial nerves and describe the pathway of sensory impulses for each special sense.
- Describe the process of taste.
- Describe the process of vision.
- Explain how eye shape affects vision.
- Describe the role of the optic chiasm in binocular vision.
- Describe the process of hearing.
- Describe the process of equilibrium.

6. Endocrine System

This unit contains chapters on Hormone Action and Regulation and Endocrine Organs and Functions. At the conclusion of this unit, students will be able to:

- Identify the major components of the endocrine system and describe their functions.
- Locate and identify the primary and secondary endocrine organs.
- Describe the mechanisms of hormone action and the role hormones play in body functions.
- Identify the hypothalamus and pituitary gland and describe their roles in hormone production.
- Identify hormones produced by the hypothalamus and describe their functions.
- Identify hormones produced by the anterior lobe of the pituitary gland and describe their functions.
- Identify hormones stored and secreted by the posterior lobe of the pituitary gland and describe their functions.
- Locate and identify target organs of pituitary hormones.
- Locate and identify the primary and secondary endocrine organs.
- Locate and identify the thyroid gland.
- Identify hormones produced by the thyroid gland and describe their functions.
- Locate and identify the parathyroid glands.
- Identify hormones produced by the parathyroid glands and describe their functions.
- Locate and identify the adrenal glands.
- Identify hormones produced by the adrenal glands and describe their functions.
- Locate and identify the pineal gland and describe its functions.
- Locate and identify the pancreas.
- Describe the location and function of pancreatic islets, and identify hormones they produce.
- Describe how pancreas hormones regulate blood glucose level.
- Identify hormones produced by secondary endocrine organs and describe their functions.
- Describe how hormones regulate the stress response.

7. Circulatory System

This unit contains chapters on Blood, Heart, and Blood Vessels and Circulation. At the conclusion of this unit, students will be able to:

- Identify the major components of the circulatory system and describe their functions.
- Describe the exchange of gases between the lungs and bloodstream.
- Identify the components of blood.
- Describe the components and functions of plasma.
- Describe the production of red blood cells and their role in oxygen transport.
- Identify the different types of white blood cells and describe their functions.
- Explain how platelets contribute to the formation of blood clots.
- Describe the production of platelets.
- Describe the functions of the heart and describe the functions of the pericardium.
- Describe the heart's location relative to the lungs, diaphragm, thoracic cage, and ribs.
- Identify the layers of the heart wall and describe each layer's function.
- Locate and identify the four chambers of the heart.
- Describe the flow of blood through the heart and the role of each atrium, ventricle, and valve in this process.
- Locate and identify the four valves of the heart.
- Locate and identify the internal structures of the heart.
- Locate and identify the systemic and pulmonary vessels that enter and exit the heart.
- Locate the arteries and veins of coronary circulation and describe their function.
- Describe the function of the conduction system.
- Describe the steps of electrical conduction that lead to ventricular contraction.
- Locate and identify the major structures of the conduction system.
- Describe the purpose of an electrocardiogram.
- Describe the steps of the cardiac cycle.
- Describe systole and diastole and explain their place in the cardiac cycle.
- Explain how cardiac output is determined.
- Locate and identify the autonomic nervous system structures that control and innervate the heart.
- Identify the five major types of blood vessels and describe their functions.
- Describe the structure and function of arteries, veins, arterioles, venules, and capillaries.

7. Circulatory System *(continued)*

- Describe the structural differences between arteries and veins.
- Describe the relationship between blood pressure and resistance.
- Explain how arterial blood pressure is measured.
- Describe systolic and diastolic pressure.
- Identify the major routes of circulation and describe their functions.
- Locate and identify the vessels of pulmonary circulation and explain how pulmonary veins and arteries differ from systemic veins and systemic arteries.
- Locate and identify structures of the lower respiratory system that contribute to gas exchange.
- Describe the functions of pulmonary arteries and pulmonary veins.
- Describe the flow of blood through systemic circulation.
- Locate and identify the great vessels of the circulatory system.
- Locate and identify arteries and veins of the head and neck.
- Locate and identify arteries and veins of the Circle of Willis
- Locate and identify the venous sinuses.
- Locate and identify arteries and veins of the upper limb.
- Locate and identify arteries and veins of the thorax.
- Locate and identify arteries and veins of the azygos system.
- Locate and identify arteries and veins of the hepatic portal system.
- Locate and identify branches of the abdominal aorta.
- Locate and identify arteries and veins of the abdomen.
- Locate and identify arteries and veins of the intestines.
- Locate and identify arteries and veins of the pelvis.
- Locate and identify arteries and veins of the leg and foot.

8. Lymphatic System

This unit contains chapters on Lymphatic System and Immunity. At the conclusion of this unit, students will be able to:

- Identify the major components of the lymphatic system and describe their functions.
- Describe the circulation of lymph throughout the body.
- Locate and identify the major vessels of the lymphatic system.
- Locate and identify lymphatic tissues and describe their functions.
- Describe the internal structure of a lymph node.
- Describe the body's innate immune defenses.
- Describe the process of phagocytosis.
- Identify the different types of white blood cells, including lymphocytes.
- Describe the body's adaptive immune defenses.
- Describe the functions of B cells and T cells.

9. Respiratory System

This unit contains chapters on the Upper Respiratory System, Lower Respiratory System, and Respiration. At the conclusion of this unit, students will be able to:

- Identify and describe the basic functions of respiratory system structures.
- Describe pulmonary ventilation and identify the structures involved.
- Describe external respiration and identify the structures involved.
- Describe internal respiration and identify the structures involved.
- Locate and identify structures that make up the upper respiratory system.
- Locate and identify structures of the nose and nasal cavity.
- Describe the functions of the nasal mucosa.
- Describe the process and function of sneezing.
- Describe the process of olfaction.
- Locate and identify structures of the pharynx.
- Describe the function of the epiglottis.
- Locate and identify structures of the larynx.
- Describe the process of phonation.
- Describe the relationship between vocal fold tension and sound pitch.
- Locate and identify structures that make up the lower respiratory system.
- Locate and identify the airways of the lower respiratory system.
- Describe the structure and function of the trachea.
- Describe bronchodilation and bronchoconstriction.

9. Respiratory System *(continued)*

- Describe the location and shape of the lungs in relation to surrounding organs.
- Locate and identify each lobe and external feature of the lungs.
- Describe the location and structure of alveoli.
- Describe the location and functions of type I alveolar cells, type II alveolar cells, and alveolar macrophages.
- Describe the internal structures of the lungs.
- Locate and identify the vessels of pulmonary circulation.
- Explain how Boyle's Law relates to breathing.
- Describe pulmonary ventilation and identify the structures involved.
- Locate and identify the muscles used during normal and forced inhalation.
- Locate and identify the muscles used during normal and forced exhalation.
- Explain how the respiratory and circulatory systems work together during external respiration.
- Describe external respiration and identify the structures involved.
- Using Dalton's Law, explain why oxygen and carbon dioxide are exchanged between the lungs and the bloodstream.
- Describe internal respiration and identify the structures involved.
- Explain how imbalances of oxygen and carbon dioxide in the bloodstream affect respiratory rate.
- Locate and identify the nervous system structures that regulate respiration.

10. Digestive System

This unit contains chapters on Oral Cavity, Esophagus and Stomach, Accessory Organs of Digestion, and Small and Large Intestines. At the conclusion of this unit, students will be able to:

- Identify the major components of the digestive system and describe their functions.
- Describe the overall structure, sections, and layers of the alimentary canal.
- Describe the components and functions of major digestive juices and explain where they are produced.
- Explain how oral cavity structures contribute to the digestive process.
- Locate and identify major structures of the oral cavity.
- Describe the process of chewing and swallowing.
- Locate and identify the upper and lower arches of teeth.
- Identify the five types of teeth and describe each type's function.
- Identify the parts of a tooth.
- Locate and identify the tongue and its extrinsic muscles.
- Explain how the tongue contributes to the sense of taste.
- Locate and identify the salivary glands and ducts.
- Locate and identify the muscles of mastication.
- Identify the epiglottis and describe its function during swallowing.
- Describe the process of peristalsis.
- Describe the location and pathway of the esophagus.
- Locate and identify the regions of the stomach.
- Identify the muscular layers of the stomach wall and explain how they differ from those of the rest of the alimentary canal.
- Locate and identify the sphincters through which food enters and exits the stomach.
- Locate and identify the major blood vessels supplying and draining the stomach wall.
- Locate and identify the accessory digestive organs of the abdominal cavity.
- Locate and identify the lobes of the liver.
- Locate and identify the ligaments of the liver.
- Identify major veins of the hepatic portal system and describe the hepatic portal system's function.
- Describe the role of the liver, gall bladder, and pancreas in producing, transporting, and storing digestive juices.
- Identify the bile ducts and describe their function.
- Identify the pancreatic ducts and duodenal papillae and describe their function.
- Locate and identify the major arteries supplying the liver, gall bladder, and pancreas.
- Describe the process of absorption that occurs in the small intestine.
- Describe the function of circular folds and villi in the small intestine.
- Locate and identify the regions of the small intestine.
- Describe the digestive processes that occur in the large intestine, including the role of bacteria.

- Locate and identify the major structures of the large intestine.
- Locate and identify the regions of the colon.
- Describe the function of the taenia coli.
- Locate and identify the major blood vessels that supply and drain the intestines.
- Explain how the defecation reflex occurs.

11. Urinary System

This unit contains chapters on Kidney Anatomy and Physiology, Urine Production, and Urine Storage and Information. At the conclusion of this unit, students will be able to:

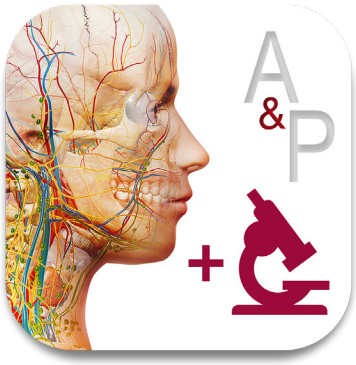
- Identify the major components of the urinary system and describe their functions.
- Describe the anatomical differences between the male and female urinary systems.
- Describe the position of the kidneys relative to other anatomical structures.
- Locate and identify structures of the kidneys and describe their functions.
- Locate and identify blood vessels that supply the kidneys.
- Describe the path of blood flow through the nephron.
- Describe the location, structure, and function of a nephron.
- Locate and identify structures involved in glomerular filtration.
- Describe the process of glomerular filtration.
- Explain how the filtration membrane filters blood plasma to create filtrate.
- Describe the processes of reabsorption and secretion, and explain why they are important.
- Describe the composition of normal urine.
- Explain how urine concentration is hormonally regulated.
- Locate and identify the structures involved in urine storage and elimination, and trace the pathway of urine from the kidneys out of the body.
- Describe the position of the bladder relative to other structures in the male and female.
- Describe the internal anatomy of the bladder.
- Describe the process of micturition.
- Explain how micturition is controlled by the nervous system.
- Locate and identify urinary system structures involved in maintaining urinary continence.
- Describe the anatomical differences between the male and female urethra.

12. Reproductive System

This unit contains chapters on the Male Reproductive System, Female Reproductive System, and Sexual Reproduction and Development. At the conclusion of this unit, students will be able to:

- Identify the major components of the male and female reproductive systems and describe their functions.
- Locate and identify the structures that make up the male reproductive system.
- Describe the role of each male reproductive structure in producing, storing, and transporting semen.
- Describe blood supply and innervation of the testes.
- Describe the process of spermatogenesis.
- Locate and identify the regions of the male urethra.
- Describe the composition and functions of semen.
- Describe the physiological changes that occur during erection and ejaculation.
- Identify the hormones involved in male reproductive functions.
- Locate and identify the structures that make up the female reproductive system.
- Identify the hormones involved in female reproductive functions.
- Describe the process of oogenesis.
- Locate and identify blood vessels that supply the uterus and ovaries.
- Describe the phases of the female reproductive cycle.
- Describe the role of each female reproductive structure in sexual reproduction.
- Locate and identify structures involved in lactation.
- Describe the process of lactation.
- Describe the events that occur during fertilization and the role of each gamete in the process.
- Describe the earliest stages of zygote development after fertilization and where these stages occur.
- Describe the primary hormones that come into play during pregnancy.
- Describe the development of reproductive anatomy in utero.
- Explain how fraternal and identical twins occur.
- Describe the stages of fetal development during pregnancy.
- Describe the process of birth.
- Explain how the reproductive system changes over the course of life.

Practice Quizzes: Multiple Choice



Cells and Tissue

2.a. Cell Structure and Function Multiple Choice

1. All of the following substances move in and out of cells, except:
   a. Nutrients
   b. Gases
   c. Waste
   ✔ d. Blood

2. The nucleus contains DNA molecules arranged in bundles called:
   a. Proteins
   b. Gametes
   c. Cytoplasm
   ✔ d. Chromosomes

3. During osmosis, if there is a hypotonic solution present around the cell then:
   ✔ a. There is a greater concentration of water outside the cell than inside it
   b. There is a greater concentration of water inside the cell than outside it
   c. There is no water inside the cell
   d. There is an equal amount of water both inside and outside the cell

4. When the concentration of a substance is higher on one side of the cell's selectively permeable membrane, certain molecules may move by osmosis or diffusion through the membrane without the cell using any energy. This process is called:
   ✔ a. Passive transport
   b. Active transport
   c. Mitosis
   d. Replication

5. When cells divide and multiply in the embryo and change in shape and structure, the process is called:
   a. Duplication
   ✔ b. Differentiation
   c. Replication
   d. Osmosis

6. The following are examples of somatic cells, except:
   a. Red blood cells
   b. Skeletal muscle cells
   ✔ c. Sex cells
   d. Osteocytes

7. In the cell cycle, which phase follows the S phase, or DNA replication?
   a. Mitosis
   b. Cytokinesis
   ✔ c. G2 phase, or protein synthesis
   d. Meiosis

8. Which of the following about the plasma membrane is not true?
   a. It is made of lipid molecules
   b. It protects the cell's cytoplasm
   c. It contains proteins
   ✔ d. It contains most of a cell's DNA

9. Within the plasma membrane, the heads of the lipids:
   a. Do not dissolve in water
   ✔ b. Are attracted to water
   c. Take in water
   d. Release water

10. The information in DNA in the nucleus is used to produce:
    ✔ a. Proteins
    b. Amino acids
    c. Lipids
    d. All of the above

11. What is the first step of cellular respiration?
    a. Two 3-carbon pyruvic acid molecules enter the mitochondria
    ✔ b. Glycolysis breaks down a 6-carbon glucose molecule into two 3-carbon pyruvic acid molecules
    c. Two ATP molecules are created and carbon dioxide is released as a waste product
    d. High-energy electrons interact with enzymes to create ATP molecules

12. _____ is located in the mitochondrial membrane.
    a. The citric acid cycle
    b. Glycolysis
    ✔ c. The electron transport chain
    d. Pyruvic acid

13. In _____, DNA's information is encoded into mRNA, whereas in _____, an mRNA template is decoded to create a protein.
    a. Translation, transcription
    b. Transcription, replication
    c. Translation, replication
    ✔ d. Transcription, translation

14. The mRNA transcript is a complementary copy of the _____ sequence.
    ✔ a. DNA
    b. tRNA
    c. Animo acid
    d. Polymerase

15. Which step begins the process of transcription?
    a. The mRNA template enters the cytoplasm
    ✔ b. RNA polymerase opens the double helix of DNA
    c. The tRNA molecule binds to the "start" codon on the mRNA strand
    d. The tRNA molecule recognizes the mRNA codon through its anticodon

16. Which molecule has a sequence that is complementary to the mRNA codon?
    a. The mRNA anticodon
    b. The tRNA codon
    ✔ c. The tRNA anticodon
    d. The "stop" codon

17. All of the following occur when the amino acids of two tRNA molecules are joined, except:
    a. The tRNA in the first position is released to get a new amino acid
    ✔ b. The mRNA molecules bring amino acids to the ribosome to be joined to the growing polypeptide
    c. The growing polypeptide is attached to the tRNA in the second position
    d. The mRNA is pulled through the ribosome so that the tRNA with the protein chain goes into the first position

3.a. Cell Life Cycle Multiple Choice

1. Cells reproduce themselves during _____ which includes _____ or _____.
    ✔ a. Cell division, mitosis, meiosis
    b. Cell division, osmosis, meiosis
    c. Protein creation, mitosis, meiosis
    d. Gamete production, sperm, ova

2. Before cells divide, DNA is copied through the process of replication. The double helix is unzipped and new nucleotides bind to their complementary bases on the free strands, forming ____ duplicates of the original.
    ✔ a. Two
    b. Three
    c. Four
    d. Five

3. During DNA replication, each tRNA molecule carries _____. As the tRNAs bind to mRNA, these link together, creating _____.
    a. A chromosome, a double helix
    b. Adenine, replication
    ✔ c. An amino acid, a peptide chain
    d. A DNA molecule, protein

4. Mitosis begins in the:
    ✔ a. Cell nucleus
    b. Peptide chain
    c. Double helix
    d. Cytoplasm

5. During mitosis, identical copies of DNA molecules organize into chromatid pairs within the chromosome structure. These pairs are connected to each other at the chromosome's centromere. This phase is called:
    a. Prometaphase
    b. Metaphase
    ✔ c. Prophase
    d. Telephase

6. _____ are produced through meiosis.
    a. Muscle cells
    b. Skin cells
    c. Blood cells
    ✔ d. Sex cells

7. Meiosis differs from mitosis for the following reasons, except:
    a. It involves two cell divisions instead of one
    b. It produces four genetically unique cells rather than two identical clones of the parent
    c. Sex cells can combine with another sex cell during fertilization to create offspring with genetic variation
    ✔ d. It is a type of diffusion

8. Cells produced by meiosis are haploid (_____ chromosomes) and those produced by mitosis are diploid (_____ chromosomes).
    ✔ a. 23, 46
    b. 25, 50
    c. 10, 20
    d. 52, 104

9. The male and female sex cells are called:
    a. Zygotes
    ✔ b. Gametes
    c. Hormones
    d. Chromosomes

10. Cytokinesis is defined as:
    a. Reproductive cell division
    ✔ b. Cytoplasmic division
    c. Somatic cell division
    d. Stage of cell division when replication of DNA occurs

4.a. Tissues Multiple Choice

1. The following are major types of body tissue, except:
    a. Epithelial tissue
    b. Connective tissue
    ✔ c. Lymphatic tissue
    d. Nervous tissue

2. Tissues develop from _____ primary germ layers.
   a. One
   b. Two
   ✔ c. Three
   d. Four

3. The following are examples of connective tissue, except:
   a. Bones
   b. Tendons
   ✔ c. Skeletal muscle
   d. Cartilages

4. _____ build new tissue by secreting collagen that takes the shape of the original tissue.
   ✔ a. Fibroblasts
   b. White blood cells
   c. Plasma cells
   d. Adipocytes

5. Epithelial tissue consists of sheets of cells that are not covered by other tissues. It can be found in the _____ and the _____.
   a. Muscles, skin
   ✔ b. Skin, linings of internal tracts
   c. Blood, tendons
   d. Neuroglia cells, cartilages

6. The following are examples of the function of nervous tissue, except:
   a. Exhibits sensitivity to different stimuli
   b. Converts stimuli into nerve impulses
   ✔ c. Strengthens nerve impulses
   d. Conducts nerve impulses to other neurons

7. When tissue repair begins, _____ work to form a meshlike clot that prevents blood loss.
   a. Mast cells
   ✔ b. Platelets
   c. Macrophages
   d. Fibroblasts

8. Blood vessels carry _____ to the site of tissue damage to assist in the repair process.
   a. Red blood cells
   b. Oxygen
   ✔ c. Platelets
   d. All of the above

9. White blood cells called _____ work to consume bacteria and remove damaged tissue and debris.
   ✔ a. Neutrophils and macrophages
   b. Macrophages and mast cells
   c. Platelets and fibroblasts
   d. Mast cells and platelets

10. The final phase of wound healing is called:
    a. Reconstruction
    b. Repair
    c. Restoration
    ✔ d. Remodeling

Integumentary System

6.a. Integumentary System Multiple Choice

1. The dermis is the _____ layer of skin.
   a. Superficial
   ✔ b. Middle
   c. Deep
   d. None of these

2. These produce an oily substance that lubricates skin and provides protection from bacteria:
   ✔ a. Sebaceous glands
   b. Mammary glands
   c. Collagen fibers
   d. Sweat glands

3. _____ detect touch stimuli and transmit these signals to sensory nerves.
   a. Melanocytes
   ✔ b. Merkel cells
   c. Keratinocytes
   d. Langerhans cells

4. All of the following are functions of skin, except:
   a. Vitamin D synthesis
   b. Protection
   c. Temperature regulation
   ✔ d. Vitamin C synthesis

5. Ultraviolet radiation from sunlight causes skin cells to produce _____, which the liver and kidneys modify to promote bone development.
   a. Vitamin C
   b. Vitamin A
   ✔ c. Vitamin D
   d. Vitamin B12

6. Hair growth occurs when cells in the _____, at the base of the bulb, divide and push upwards.
   a. Hair follicle
   b. Root
   c. Shaft
   ✔ d. Hair matrix

7. Nails are hard plates of dead epidermal cells that have been converted into:
   ✔ a. Keratin
   b. Melanin
   c. Collagen
   d. Calcium

8. When scarring occurs after a deep wound, healed tissue:
   a. Loses all function
   ✔ b. Loses its normal function
   c. Maintains its normal function
   d. Creates new functionality

9. During integumentary innervation, sensory receptors in the skin pass signals to:
   a. Glands
   b. Nerves of the autonomic system
   ✔ c. Nerves of the peripheral nervous system
   d. All of the above

10. Blood vessels carry _____ to the site of tissue damage, causing a fibrous clot to form.
   ✔ a. Platelets
   b. Melanin
   c. Epithelial cells
   d. Fibroblasts

Skeletal System and Joints

8.a. Types of Bones Multiple Choice

1. Long bones are adapted for all of the following, except:
   ✔ a. Protecting internal organs
   b. Absorbing stress
   c. Supporting body weight
   d. Facilitating movement

2. Which of the following is not a flat bone?
   a. Rib
   b. Frontal bone
   c. Scapula
   ✔ d. Vertebra

3. The carpals of the wrist are examples of which bone type?
   a. Irregular
   b. Sesamoid
   ✔ c. Short
   d. Flat

4. The medullary cavity of a long bone is located inside the:
   a. Proximal epiphysis
   ✔ b. Diaphysis
   c. Distal epiphysis
   d. Articular cartilage

5. The articular cartilage of a long bone covers the:
   a. Distal epiphysis
   b. Proximal epiphysis
   c. Diaphysis
   ✔ d. a and b

6. Moving from deep to superficial, the layers covering bone marrow are:
   a. Compact bone, spongy bone, periosteum
   ✔ b. Spongy bone, compact bone, periosteum
   c. Periosteum, spongy bone, compact bone
   d. Spongy bone, periosteum, compact bone

7. The patella is an example of which bone type?
   ✔ a. Sesamoid
   b. Irregular
   c. Short
   d. Flat

8. Flat bones lack which of the following?
   ✔ a. Medullary cavity
   b. Spongy bone
   c. Periosteum
   d. Bone marrow

9. All of the following are long bones, except:
   a. Humerus
   ✔ b. Rib
   c. Phalanges
   d. Fibula

10. Which is an example of an irregular bone?
   ✔ a. Vertebra
   b. Patella
   c. Scapula
   d. Metacarpal

9.a. Bone Tissue Multiple Choice

1. The function of osteoclasts is to:
   a. Synthesize bone matrix
   b. Maintain bone tissue structure
   c. Absorb nutrients
   ✔ d. Break down bone matrix

2. Which of the following structural elements are unique to compact bone?
   a. Lamellae
   ✔ b. Osteons
   c. Canaliculi
   d. Osteocytes

3. In a long bone, yellow bone marrow is found in the _____, and red bone marrow is found in the _____.
   ✔ a. Medullary cavity, spongy bone
   b. Compact bone, trabeculae
   c. Canaliculi, spongy bone
   d. Central canal, medullary cavity

4. Which of the following is not true about the formation of flat bones?
✔ a. They develop through endochondral ossification
b. Osteoblasts secrete bone matrix
c. Osteoblasts develop into osteocytes and form trabeculae
d. A layer of compact bone replaces the upper layers of spongy bone

5. In the embryonic development of long bones, _____ secrete and form a shaft of _____.
a. Osteoblasts, articular cartilage
b. Osteoclasts, compact bone
✔ c. Chondroblasts, hyaline cartilage
d. Osteocytes, trabeculae

6. Place the following steps of bone repair in order:
i. Formation of a bony callus
ii. Formation of a fibrocartilaginous callus
iii. Blood clotting and formation of a fracture hematoma
iv. Remodeling of bone at the site
v. Removal of dead bone cells by osteoclasts
a. ii, v, iii, i, iv
b. v, ii, iii, iv, i
c. iii, i, v, ii, iv
✔ d. iii, v, ii, i, iv

7. Which best describes a comminuted fracture?
a. The broken bone pierces the skin
✔ b. The bone is crushed or shattered
c. The bone is partially fractured
d. One end of the broken bone is driven into the other end

8. Osteoporosis results from a higher rate of bone _____ relative to _____.
✔ a. Reabsorption, deposition
b. Deposition, reabsorption
c. Growth, remodeling
d. Fracturing, growth

9. If the end of a broken bone pierces the skin, the fracture is considered a(n):
a. Comminuted fracture
b. Greenstick fracture
✔ c. Compound fracture
d. Impacted fracture

10. The cells that build up bone tissue are called:
a. Osteoclasts
✔ b. Osteoblasts
c. Chondroblasts
d. Osteocytes

10.a. Axial Skeleton Multiple Choice

1. Which of the following is not a bone of the axial skeleton?
a. Occipital
b. Vertebra
c. Rib
✔ d. Clavicle

2. All of the following bones are cranial bones, except:
a. Occipital
✔ b. Maxilla
c. Sphenoid
d. Temporal

3. Which of the following facial bones is unpaired?
a. Maxilla
b. Zygomatic
c. Lacrimal
✔ d. Vomer

4. The joint between each parietal bone and occipital bone is called the _____ suture.
✔ a. Lambdoid
b. Sagittal
c. Coronal
d. Squamous

5. Which describes the order of the auditory ossicles, from outer to inner?
a. Incus, malleus, stapes
b. Stapes, incus, malleus
✔ c. Malleus, incus, stapes
d. Incus, stapes, malleus

6. Which foramen does the spinal cord pass through?
✔ a. Foramen magnum
b. Foramen ovale
c. Mental foramen
d. Condyloid foramen

7. The function of fontanelles is to:
a. Tightly bind the cranial bones together
✔ b. Allow the cranium to expand
c. Protect the brain
d. Prevent motion of the cranial bones

8. All joints in the skull are sutures, except for the joint between the:
a. Sphenoid and temporal bones
b. Occipital and parietal bones
c. Maxillae and zygomatic bones
✔ d. Mandible and temporal bones

9. Cervical vertebrae differ from other vertebrae in what way?
a. They have bifid spinous processes
b. They have transverse foramina
c. They have large vertebral bodies
✔ d. a and b

10. The ligament running down the surface of the vertebral bodies is called the _____ ligament.
    a. Posterior longitudinal
    b. Supraspinous
✔ c. Anterior longitudinal
    d. Intertransverse

11.a. Appendicular Skeleton Multiple Choice

1. Which of the following is true about the scapula?
    a. It articulates with the axial skeleton
✔ b. It is stabilized by muscles
    c. It forms part of the upper limb
    d. It tends not to be mobile

2. The carpal bones articulate with all of the following except:
    a. Ulna
    b. Radius
    c. Metacarpals
✔ d. Phalanges

3. The carpal tunnel is bordered by the _____ and the _____.
✔ a. Flexor retinaculum, carpal bones
    b. Extensor retinaculum, carpal bones
    c. Carpal bones, flexor tendons
    d. Metacarpal bones, extensor tendons

4. The knuckles are created by the articulation between the _____ and the _____.
    a. Metacarpals, carpals
✔ b. Phalanges, metacarpals
    c. Phalanges, carpals
    d. Carpals, ulna

5. The pelvic bones articulate with the femur at the:
    a. Pubic symphysis
    b. Obturator foramen
✔ c. Acetabulum
    d. Sacrum

6. The male pelvis is _____ and _____ than the female pelvis.
✔ a. Deeper, narrower
    b. Wider, deeper
    c. Shallower, wider
    d. Narrower, shallower

7. The fibula articulates with which of the following?
✔ a. Tibia
    b. Femur
    c. Calcaneus
    d. a and b

8. Arches of the foot do all of the following except:
    a. Distribute stress
    b. Support body weight
    c. Absorb shock
✔ d. Facilitate eversion and inversion

9. The bone that makes up the majority of the heel is the:
    a. Talus
✔ b. Calcaneus
    c. Navicular
    d. Cuboid

10. Which of the following is not a tarsal bone?
    a. Calcaneus
    b. Cuboid
    c. Talus
✔ d. None; they are all tarsals

12.a. Joints Multiple Choice

1. Which of the following would not be considered a fibrous joint?
    a. The joint between the parietal bone and the occipital bone
    b. The joint between a tooth and the mandible
✔ c. The pubic symphysis
    d. The interosseous membrane of the leg

2. The distal joint between the tibia and fibula is an example of a:
✔ a. Syndesmosis
    b. Suture
    c. Synchrondosis
    d. Synovial joint

3. Which of the following is an example of a gliding joint?
✔ a. Intervertebral joint
    b. Elbow joint
    c. Temporomandibular joint
    d. Wrist joint

4. Ball-and-socket joints allow for movement along:
    a. Two axes
✔ b. All axes
    c. Three axes
    d. One axis

5. The joint between the axis and atlas that allows for rotation of the head is which kind of joint?
    a. Ball-and-socket
    b. Hinge
    c. Condyloid
✔ d. Pivot

6. Which motions are allowed by the wrist joint?
    a. Flexion
    b. Extension
    c. Circumduction
✔ d. All of these

7. The purpose of articular cartilage is to:
    a. Connect articulating bones
✔ b. Prevent the contact of articulating bone surfaces
    c. Secrete synovial fluid
    d. Provide flexibility for growth

8. Osteoarthritis is caused primarily by:
   a. Degeneration of bone at the joint
   b. Excess bone at the joint
✔ c. Degeneration of articular cartilage
   d. Degeneration of ligaments

9. The joint between the metacarpal bone of the thumb and the carpus is which type of joint?
✔ a. Saddle
   b. Hinge
   c. Ball-and-socket
   d. Condyloid

10. Which of the following characteristics is unique to synovial joints?
   a. They are supported by ligaments
   b. They join long bones together
   c. They include cartilage
✔ d. They contain joint cavities

Muscle Tissue and Muscular System

14.a. Skeletal Muscle Tissue Multiple Choice

1. The three types of muscle tissue are:
   a. Skeletal, digestive, vascular
✔ b. Smooth, cardiac, skeletal
   c. Skeletal, smooth, striated
   d. Cardiac, skeletal, tendinous

2. The place where an impulse is transmitted from a motor neuron to a skeletal muscle is called the:
   a. Intercalated disc
   b. Myofibril
   c. Origin point
✔ d. Neuromuscular junction

3. The neurotransmitter released by motor neurons that stimulates skeletal muscle is called:
✔ a. Acetylcholine
   b. Norepinephrine
   c. Acetylcholinesterase
   d. Epinephrine

4. Which best describes the structural components of skeletal muscle from largest to smallest?
✔ a. Fascicle, fiber, myofibril, thick and thin filaments
   b. Fiber, fascicle, thick and thin filaments, myofibrils
   c. Thick filaments, thin filaments, myofibrils, fascicle, fiber
   d. Myofibril, thick filament, fascicle, thin filament

5. The binding of _____ to the receptor on an ion channel causes the channel to open, allowing an influx of _____ ions into the muscle fiber.
   a. Calcium, sodium
   b. Acetylcholine, calcium
✔ c. Acetylcholine, sodium
   d. Sodium, acetylcholine

6. Which step of muscle contraction is called the "power stroke"?
   a. Troponin slides to reveal actin-binding sites
   b. Myosin filaments pull together and slide across one another
   c. The sarcoplasmic reticulum within a muscle fiber releases calcium ions
✔ d. Myosin heads move the actin filaments inward, shortening the sarcomere

7. Sarcomeres contain:
✔ a. Actin and myosin filaments
   b. Actin filaments and epimysium
   c. Fascicles and motor neurons
   d. Myofibrils and capillaries

8. All of the following are characteristics of skeletal muscles, except:
   a. They are under voluntary control
   b. They are striated
✔ c. They are under involuntary control
   d. Their ability to contract depends on the structure of their fibers and the surrounding nerves

9. Which of the following occurs when the myosin heads bind to actin?
   a. The myosin heads are cocked for the next stroke
✔ b. The cross bridges are established
   c. The sarcoplasmic reticulum within a muscle fiber releases calcium ions
   d. Calcium ions bind to a protein complex

10. The proteins within a muscle cell are organized into large cells called:
   a. Sarcomeres
   b. Filaments
   c. Fascicles
✔ d. Myofibrils

15.a. Smooth and Cardiac Muscle Tissue Multiple Choice

1. Which of the following statements about muscle tissue are true?
   i. Skeletal muscle tissue is the only striated type of muscle tissue
   ii. Cardiac and smooth muscle respond to involuntary nervous signals
   iii. Cardiac muscle is found only in the heart
   iv. Smooth muscle of the esophagus contracts in peristaltic waves

   a. i, ii, iii, and iv
   b. iii and iv
   ✔ c. ii, iii, and iv
   d. iii only

2. Smooth muscle does all of the following, except:
   a. Move food along the digestive tract
   b. Generate peristalsis
   ✔ c. Contract voluntarily to move blood through the vasculature
   d. Form part of the walls of the airways of the respiratory system

3. Smooth muscle can be found in which of the following systems?
   a. Circulatory
   b. Respiratory
   c. Digestive
   ✔ d. All of the above

4. The outermost smooth muscle layer of the stomach is the:
   ✔ a. Longitudinal layer
   b. Oblique layer
   c. Circular layer
   d. Spiral layer

5. All of the following statements about cardiac muscle are true, except:
   a. It is found only in the myocardium
   b. It responds to involuntary impulses from the conduction system
   ✔ c. It is not striated
   d. It contracts in a constant rhythm to make the heart beat

6. All of the following are part of the cardiac conduction system, except:
   a. The Purkinje fibers
   b. The sinoatrial node
   ✔ c. The chordae tendineae
   d. The atrioventricular node

7. Which layer of the heart wall lines the heart's internal structures and is continuous with the lining of blood vessels that attach to the heart?
   a. The epicardium
   b. The visceral pericardium
   c. The myocardium
   ✔ d. The endocardium

8. The _____ is a conical pouch formed by the upper and left portion of the right ventricle that leads to the pulmonary trunk.
   a. Interventricular septum
   ✔ b. Conus arteriosus
   c. Chordae tendineae
   d. Moderator band

9. Which of the following is the layer of the blood vessel wall that consists of smooth muscle and elastic fibers?
   ✔ a. The tunica media
   b. The tunica adventitia
   c. The tunica intima
   d. The internal elastic membrane

10. Contractions of smooth muscle in the _____ wall propel urine into the bladder.
    a. Urethra
    b. Kidneys
    ✔ c. Ureter
    d. Renal pelvis

16.a. Muscular System Multiple Choice

1. In elbow flexion, the biceps brachii is the _____ and the triceps brachii is the _____.
   a. Antagonist, agonist
   ✔ b. Agonist, antagonist
   c. Origin, insertion
   d. Agonist, prime mover

2. Which of the following are paired and opposing muscle actions?
   a. Extension, rotation
   ✔ b. Supination, pronation
   c. Rotation, supination
   d. Flexion, bending

3. The points at which the tendons of a skeletal muscle attach to two articulating bones are called the:
   a. Agonist and antagonist
   b. Aponeuroses
   ✔ c. Origin and insertion
   d. Bursae

4. Which of the following actions is an example of a first-class lever?
   ✔ a. Lifting the chin
   b. Standing on tip-toe
   c. Flexing the elbow
   d. All of the above

5. Which muscles contract to produce the main effort required to stand on your toes?
   a. Quadriceps
   ✔ b. Gastrocnemius
   c. Biceps femoris
   d. Tibialis anterior

6. When the biceps brachii contract, which bone is pulled upward?
   a. Humerus
   b. Scapula
   ✔ c. Radius
   d. Clavicle

7. When you lift your chin when nodding, which muscles are contracting?
   a. Prevertebral muscles
   b. Platysma
   c. Mastication muscles
   ✔ d. Upper back muscles

8. Which of the following is not a muscle of mastication?
   a. Temporalis
   ✔ b. Zygomaticus major
   c. Deep masseter
   d. Lateral pterygoid

9. Which muscles are not prime movers of back extension?
   a. Spinalis muscles
   b. Longissimus muscles
   c. Iliocostalis muscles
   ✔ d. Latissimus dorsi muscles

10. When breathing normally (not forced), which of the following muscles are you using?
    a. Internal intercostals
    b. Abdominals
    ✔ c. Diaphragm
    d. a and c

11. Contraction of the abdominal muscles results in:
    ✔ a. Flexion of the vertebral column
    b. Extension of the vertebral column
    c. Rotation of the hip
    d. Forced inspiration

12. Which is a prime mover of the humerus?
    a. Teres major
    ✔ b. Pectoralis major
    c. Infraspinatus
    d. Biceps brachii

13. The _____ muscles are located on the posterior side of the forearm.
    a. Flexor
    b. Pronator
    c. Adductor
    ✔ d. Extensor

14. Muscles in the anterior compartment of the thigh _____ the knee, and muscles in the posterior compartment of the thigh _____ the knee.
    a. Flex, extend
    b. Rotate medially, rotate laterally
    ✔ c. Extend, flex
    d. Pronate, supinate

15. The Achilles or calcaneal tendon is the common tendon of insertion for which muscles?
    a. Soleus and tibialis posterior
    b. Fibularis longus and fibularis brevis
    c. Tibialis anterior and tibialis posterior
    ✔ d. Gastrocnemius and soleus

Nervous System and Special Senses

18.a. Nervous Tissue Multiple Choice

1. A neuron receives signals at its:
   a. Axon terminal
   ✔ b. Dendrites
   c. Nucleus
   d. Axon

2. The cells that create a myelin sheath around peripheral nerve axons are called:
   ✔ a. Schwann cells
   b. Satellite cells
   c. Oligodendrocytes
   d. Astrocytes

3. In a resting state, the plasma membrane of a neuron is:
   a. Depolarized
   ✔ b. Polarized
   c. Hyperpolarized
   d. Impermeable

4. Signals are passed through the nervous system:
   a. Electrically
   b. Chemically
   c. Mechanically
   ✔ d. a and b

5. The wave of depolarization that is propagated down an axon is known as the:
   a. Graded potential
   b. Resting potential
   ✔ c. Action potential
   d. Refractory period

6. Which of the following statements about neurotransmitters is false?
   a. Excitatory neurotransmitters may generate an action potential in the neuron they reach
   ✔ b. At a neuromuscular junction, acetylcholine has inhibitory effects
   c. Dopamine helps regulate muscle tone
   d. Norepinephrine is found in both the central and peripheral nervous systems

7. A signal moves through the parts of a single neuron in what order?
   ✔ a. Dendrites, cell body, axon, axon terminals
   b. Axon terminals, axon, cell body, dendrites
   c. Cell body, dendrites, axon, axon terminals
   d. Axon, dendrites, axon terminals, cell body

8. A myelinated axon transmits a signal _____ a non-myelinated axon.
   a. More slowly than
   ✔ b. More quickly than
   c. At the same rate as
   d. More accurately than

9. When a neuron is not transmitting a signal, which of the following is true?
   a. The cell membrane is depolarized
   b. The cell contains an action potential
   c. The cell cannot be stimulated by neurotransmitters
   ✔ d. The net charge inside the cell is negative

10. Which type of cells phagocytize debris in the central nervous system?
    a. Ependymal cells
    b. Astrocytes
    ✔ c. Microglia
    d. Oligodendrocytes

19.a. Spinal Cord and Spinal Nerves
Multiple Choice

1. The innermost layer of the meninges of the spinal cord is the:
   a. Dura mater
   ✔ b. Pia mater
   c. Arachnoid mater
   d. Subarachnoid space

2. All of the following are true about gray and white matter in the spinal cord, except:
   ✔ a. Gray matter passes information up and down the spinal cord
   b. Regions called horns contain gray matter
   c. White matter is arranged in columns
   d. Tracts consist of white matter

3. Dorsal roots carry _____ signals _____ the spinal cord, while ventral roots carry _____ signals _____ the spinal cord.
   a. Motor, into; sensory, out of
   b. Motor, out of; sensory, into
   ✔ c. Sensory, into; motor, out of
   d. Sensory, out of; motor, into

4. Each dermatome sends sensory signals through:
   a. A single left spinal nerve or right spinal nerve, but not both
   b. A single nerve plexus
   c. A segment of the spinal cord corresponding to a plexus
   ✔ d. A single pair of spinal nerves

5. The axillary nerve is a major nerve of the _____ plexus.
   a. Cervical
   ✔ b. Brachial
   c. Lumbar
   d. Sacral

6. The major nerve that passes from the level of the sacrum down the posterior leg is the _____ nerve.
   ✔ a. Sciatic
   b. Femoral
   c. Genitofemoral
   d. Obturator

7. Which plexus innervates muscles of the neck?
   ✔ a. Cervical
   b. Brachial
   c. Lumbar
   d. Sacral

8. Which spinal nerve roots form the brachial plexus?
   a. C1–C4
   ✔ b. C5–C8
   c. T1–T12
   d. L1–L5

9. Why can spinal reflexes occur more quickly than premeditated actions?
   a. Reflexes utilize different motor neurons
   b. Reflex actions do not involve the central nervous system
   ✔ c. The signal for a spinal reflex is processed in the spinal cord rather than the cerebrum
   d. Sensory information travels faster during a reflex action

10. What function does gray matter serve in spinal reflexes?
    a. It transmits the reflex signal to the brain
    b. It receives the signal at the point of external stimulus
    c. It transmits a command from the spinal cord to a skeletal muscle
    ✔ d. It acts as a processing center for the reflex signal

20.a. Brain Multiple Choice

1. Which of the following statements about cerebrospinal fluid is false?
   a. It provides shock absorption during impact
   b. It passes substances between the blood and the nervous system
   ✔ c. It only circulates through the ventricles of the brain
   d. It is absorbed into venous blood

2. Which structure is not part of the brainstem?
   ✔ a. Cerebellum
   b. Medulla oblongata
   c. Pons
   d. Thalamus

3. The primary function of the cerebellum is to:
   a. Process sensory input
   ✔ b. Coordinate movement and muscle tone
   c. Issue motor commands directly to muscles
   d. Relay reflex signals

4. The hypothalamus does all of the following, except:
   a. Regulate ANS activity
   b. Produce hormones
   c. Control body temperature
   ✔ d. Control voluntary muscle contraction

5. Which part of the brain is responsible for establishing emotional states?
   a. Thalamus
   ✔ b. Limbic system
   c. Cerebellum
   d. Medulla oblongata

6. The function of the thalamus is to:
   a. Relay sensory information to the cerebral cortex
   b. Maintain consciousness
   c. Relay motor commands to the brainstem
   ✔ d. a and b

7. The primary motor cortex is located on which surface feature of the brain?
   ✔ a. Precentral gyrus
   b. Postcentral gyrus
   c. Cingulate gyrus
   d. Parieto-occipital sulcus

8. Which of the following functions would typically be associated with the right hemisphere of the cerebrum?
   a. Language interpretation
   b. Mathematical calculation
   c. Control of muscles of the right side of the body
   ✔ d. Recognizing emotions

9. Which best describes the pathway of circulation for cerebrospinal fluid?
   a. Lateral ventricles, third ventricle, fourth ventricle
   ✔ b. Lateral ventricles, third ventricle, fourth ventricle, central canal
   c. Central canal, fourth ventricle, third ventricle, lateral ventricles
   d. Fourth ventricle, third ventricle, lateral ventricles

10. Which substance(s) cannot usually cross the blood–brain barrier?
    a. Glucose
    b. Carbon dioxide
    ✔ c. Proteins
    d. Ions

21.a. Cranial Nerves Multiple Choice

1. Which cranial nerve connects directly to the cerebrum?
   a. Optic
   ✔ b. Olfactory
   c. Trigeminal
   d. Oculomotor

2. The ophthalmic, maxillary, and mandibular nerves are all branches of the:
   ✔ a. Trigeminal nerve
   b. Facial nerve
   c. Abducens nerve
   d. Glossopharyngeal nerve

3. Impulses for hearing and equilibrium are carried through which cranial nerve?
   a. VII
   b. IV
   ✔ c. VIII
   d. V

4. Cranial nerve X innervates which body part(s)?
   a. Ears
   b. Trapezius muscle
   ✔ c. Stomach
   d. Tongue

5. The optic nerve ends in the _____.
   ✔ a. Thalamus
   b. Cerebrum
   c. Pons
   d. Medulla oblongata

6. Which of the following nerves has only motor functions?
   a. Olfactory
   b. Facial
   c. Glossopharyngeal
   ✔ d. Hypoglossal

7. The eyeball is moved by the:
   a. Optic nerve
   b. Oculomotor nerve
   c. Abducens nerve
✔ d. b and c

8. Which nerve carries sensory signals from taste buds?
   a. XI
✔ b. IX
   c. VIII
   d. VI

9. Which of the following statements about cranial nerves is false?
   a. They arise from the brain
   b. They are part of the peripheral nervous system
✔ c. They innervate only the head and neck
   d. They are numbered based on where they originate along the brain's long axis

10. The cranial nerves that are purely sensory nerves are:
    a. III, IV, VI, XI, and XII
    b. I, II, and III
    c. I, II, V, and VII
✔ d. I, II, and VIII

22.a. Somatic and Autonomic Nervous Systems Multiple Choice

1. Which of the following body functions is controlled by the somatic nervous system?
   a. Heart rate
   b. Peristalsis
✔ c. Skeletal muscle movement
   d. Respiration

2. All of the following are sympathetic responses, except:
✔ a. Digestion
   b. Pupil dilation
   c. Increase of blood glucose level
   d. Dilation of airways

3. Which of the following is not a somatic sensory pathway?
   a. Anterolateral (spinothalamic)
✔ b. Anterior corticospinal
   c. Posterior column-medial lemniscus
   d. Posterior spinocerebellar

4. Touch receptors in the skin that carry signals for vibration are known as _____.
   a. Baroreceptors
   b. Chemoreceptors
✔ c. Pacinian corpuscles
   d. Free nerve endings

5. If you are being chased by a bear, your _____ nervous system functions have likely been put on hold.
   a. Autonomic
   b. Sympathetic
✔ c. Parasympathetic
   d. Somatic

6. Sympathetic nerves arise from the:
✔ a. Thoracic and lumbar spinal cord
   b. Brain stem and sacral spinal cord
   c. Cervical and thoracic spinal cord
   d. Cerebrum and brain stem

7. Meissner corpuscles can detect all of the following, except:
   a. Touch
   b. Pressure
   c. Vibration
✔ d. Temperature

8. The somatic nervous system (SNS) is different from the autonomic nervous system in which way?
   a. SNS nerves carry only motor signals
✔ b. SNS motor neurons do not synapse at ganglia
   c. The SNS is responsible for all muscle tissue contraction in the body
   d. The SNS does not relay tactile sensory information

9. The cranial nerves that have autonomic functions are:
   a. I, III, and X
   b. VII, IX, II, and XI
✔ c. III, VII, IX, and X
   d. I, II, VIII, and IX

10. Parasympathetic neurons release which neurotransmitter?
✔ a. Acetylcholine (ACh)
   b. Norepinephrine (NE)
   c. Epinephrine (E)
   d. All of the above

23.a. Special Senses Multiple Choice

1. In vision, light passing through the _____ is refracted and projected onto the _____.
   a. Vitreous chamber, cornea
   b. Retina, lens
✔ c. Lens, retina
   d. Lens, cornea

2. When the lens focuses incoming light at a point within the vitreous chamber, which occurs?
✔ a. Nearsightedness
   b. Farsightedness
   c. Normal vision
   d. Better than normal vision

3. Vibrations are transferred through the ear in which order?
   a. Stapes, incus, malleus, tympanic membrane, cochlea
   b. Malleus, incus, stapes, tympanic membrane, cochlea
   ✔ c. Tympanic membrane, malleus, incus, stapes, cochlea
   d. Tympanic membrane, incus, stapes, malleus, cochlea

4. One function of the optic chiasm is to:
   a. Adjust the refraction of light in the eye
   ✔ b. Allow for depth perception
   c. Transmit signals from the optic nerve to the cerebellum
   d. Prevent overlap of the visual field from each eye

5. Equilibrium is sensed through:
   a. The tympanic membrane
   b. The oval window
   c. Auditory ossicles
   ✔ d. Hair cells

6. Which of the following is a chemical sense?
   a. Equilibrium
   ✔ b. Gustation
   c. Vision
   d. Hearing

7. The largest papillae, found at the back of the tongue, are the _____ papillae.
   ✔ a. Vallate (circumvallate)
   b. Foliate
   c. Filiform
   d. Fungiform

8. The olfactory nerve passes through which of the following structures?
   a. Sphenoid bone
   b. Nasal cavity
   ✔ c. Cribriform plate
   d. Frontal sinus

9. The Organ of Corti is contained within the:
   a. Scala vestibuli
   ✔ b. Cochlear duct
   c. Scala tympani
   d. Semicircular canals

10. Which of the following is not one of the primary tastes?
    a. Bitter
    b. Salty
    ✔ c. Spicy
    d. Sour

Endocrine System

25.a. Hormone Action and Regulation
Multiple Choice

1. The following body functions are regulated by glands in the endocrine system, except:
   ✔ a. All of these are regulated by hormones
   b. Sexual development and function
   c. Metabolism and growth
   d. Immune responses

2. The _____ gland oversees metabolism and growth, while the _____ oversees immune responses.
   a. Parathyroid, thymus
   b. Gonads, thyroid
   c. Adrenals, thyroid
   ✔ d. Thyroid, thymus

3. The hypothalamus releases regulatory hormones into the hypophyseal portal system, a closed capillary bed around the:
   a. Adrenal gland
   ✔ b. Anterior pituitary gland
   c. Hypothalamus
   d. Thyroid

4. What does the pituitary gland produce?
   a. Sweat
   ✔ b. Hormones
   c. Sex cells
   d. Blood cells

5. One type of hormone produced by the anterior lobe of the pituitary gland regulates:
   a. Blood pressure
   b. Urine production
   ✔ c. Growth
   d. Uterine contractions

6. Hormones do all of the following, except:
   a. Bind to receptors on the surface of the target cell
   b. Pass through the cell membrane
   ✔ c. Get secreted by glands through hollow ducts
   d. Attach to receptors in the cytoplasm or nucleus

7. Which hormones are produced in the hypothalamus and stored in the posterior pituitary?
   ✔ a. Antidiuretic hormone (ADH) and Oxytocin (OXT)
   b. Adrenocorticotropic hormone (ACTH) and antidiuretic hormone (ADH)
   c. Luteinizing hormone (LH) and oxytocin (OXT)
   d. Melanocyte-stimulating hormone (MSH) and thyroid-stimulating hormone (TSH)

8. Which hormone causes the adrenal glands to produce steroid hormones that influence the metabolism of glucose?
   a. Melanocyte-stimulating hormone (MSH)
   ✔ b. Adrenocorticotropic hormone (ACTH)
   c. Oxytocin (OXT)
   d. Luteinizing hormone (LH)

9. Which hormone is responsible for milk production in a new mother?
   a. Thyroid-stimulating hormone (TSH)
   b. Melanocyte-stimulating hormone (MSH)
   c. Adrenocorticotropic hormone (ACTH)
   ✔ d. Prolactin (PRL)

10. All of the following are functions of human growth hormone, except:
    a. Growth of skeletal muscles
    ✔ b. Regulation of urine output
    c. Lipid metabolism
    d. Growth of skeletal tissues

26.a. Endocrine Organs and Functions Multiple Choice

1. The thyroid gland is located _____ the trachea and _____ the larynx.
   ✔ a. Anterior to, inferior to
   b. Inferior to, anterior to
   c. Posterior to, inferior to
   d. Inferior to, posterior to

2. The thyroid gland releases the hormones thyroxine (T4) and triiodothyronine (T3), which do the following, except:
   a. Increase metabolism
   b. Increase nervous system development
   c. Increase glucose use
   ✔ d. Prohibit protein synthesis

3. The parathyroid glands secrete _____ which increases calcium levels in the blood by stimulating the bones, intestines, and kidneys.
   a. Thyroxine (T4)
   b. Melatonin
   ✔ c. Parathyroid hormone
   d. Epinephrine (E)

4. Corticosteroids are hormones that affect the breakdown of proteins and the reabsorption of water and sodium. They are produced by the:
   ✔ a. Adrenal cortex
   b. Parathyroid gland
   c. Thyroid gland
   d. Kidneys

5. The adrenal glands are located superior to the kidneys on either side of the:
   a. Liver
   b. Stomach
   ✔ c. Vertebral column
   d. Thyroid gland

6. The pineal gland produces the hormone _____, which protects nervous tissue and regulates sleeping patterns.
   a. Glucagon
   ✔ b. Melatonin
   c. Corticosteroids
   d. Estrogen and progesterone

7. Low blood glucose causes alpha cells of the pancreas to release _____, which triggers the release of glucose by the liver.
   ✔ a. Glucagon
   b. Insulin
   c. Somatostatin
   d. Progesterone

8. The pancreatic islets are clusters of cells in the pancreas that secrete the following hormones, except:
   a. Insulin
   b. Glucagon
   ✔ c. Testosterone
   d. Somatostatin

9. One of the hormones released by the kidneys is:
   a. Natriuretic peptides
   ✔ b. Erythropoietin
   c. Estrogen
   d. Melatonin

10. Stress stimulates the _____ to produce hormones that ramp up body activity in the fight-or-flight response.
    a. Pancreas
    ✔ b. Adrenal glands
    c. Thyroid
    d. Pineal gland

Circulatory System

28.a. Blood Multiple Choice

1. The main components of blood are:
   ✔ a. Platelets, red blood cells, plasma, white blood cells
   b. Red blood cells, platelets
   c. Proteins, plasma, neutrophils
   d. White blood cells, red blood cells, oxygen

2. Blood does all of the following, except:
   a. Destroy invading pathogens
   b. Transport oxygen and carbon dioxide
   c. Transport endocrine hormones
   ✔ d. Produce stem cells

3. Which of the following are true?
   i. Mature red blood cells do not contain a nucleus
   ii. Red blood cells contain hemoglobin, which binds to oxygen
   iii. Red blood cells transport oxygen to body cells and transport some carbon dioxide from body cells
   iv. Hemocytoblasts give rise to all types of blood cells

   a. i, ii, and iii
   b. ii and iii only
   c. ii, iii, and iv
   ✔ d. i, ii, iii, and iv

4. Where are red blood cells produced?
   a. Lymphatic vessels
   b. Heart chambers
   ✔ c. Red bone marrow
   d. Yellow bone marrow

5. All of the following types are white blood cells, except:
   a. Neutrophils
   b. Lymphocytes
   c. T cells
   ✔ d. Platelets

6. Neutrophils perform which of the following functions?
   a. Produce antibodies
   ✔ b. Phagocytize bacteria
   c. Destroy infected body cells
   d. Deliver carbon dioxide to the lungs

7. Although plasma is _____ percent water, it also transports _____ and _____.
   a. 70%, cells, proteins
   b. 50%, oxygen, carbon dioxide
   ✔ c. 90%, nutrients, wastes
   d. 20%, lymphocytes, bone particles

8. Platelets stop blood loss by:
   a. Collecting and adhering at the site of damage
   b. Triggering a reaction that promotes the formation of fibrin threads
   c. Forming a platelet plug
   ✔ d. All of the above

9. B and T cells spend most of their time in the _____.
   a. Bloodstream
   ✔ b. Lymphatic system
   c. Heart chambers
   d. Capillaries

10. Blood traveling from the lungs is _____, and blood traveling to the lungs is _____.
   ✔ a. Oxygenated, deoxygenated
   b. Deoxygenated, oxygenated
   c. High-pressure, low-pressure
   d. Nitrogen-rich, nitrogen-poor

29.a. Heart Multiple Choice

1. The heart is located _____ the thoracic cage, _____ the lungs, and _____ to the diaphragm.
   a. Lateral to, within, inferior to
   b. Inside, inferior to, between
   ✔ c. Within, between, superior to
   d. To the left of, beneath, behind

2. The flow of blood through the heart and pulmonary circulation occurs in which sequence?
   a. Left atrium, mitral valve, left ventricle, aortic valve, right atrium, tricuspid valve, right ventricle, pulmonary valve
   ✔ b. Right atrium, tricuspid valve, right ventricle, pulmonary valve, pulmonary circulation, left atrium, mitral valve, left ventricle, aortic valve
   c. Aortic valve, right ventricle, mitral valve, right atrium, superior vena cava
   d. Right atrium, left atrium, mitral valve, right ventricle, left ventricle, tricuspid valve, pulmonary circulation, pulmonary valve, aorta

3. Blood moving from the atria into the ventricles flow through which two valves?
   a. Pulmonary and mitral (bicuspid or left AV)
   b. Aortic and pulmonary
   ✔ c. Tricuspid (right AV) and mitral (bicuspid or left AV)
   d. Tricuspid (right AV) and aortic

4. Which part of the heart's conduction system sends the impulse that begins the process of conduction?
   a. Atrioventricular (AV) node
   ✔ b. Sinoatrial (SA) node
   c. Bundle of His
   d. Purkinje fibers

5. An impulse travels through the heart's conduction system in which of the following sequences?
   a. Atrioventricular (AV) node, bundle of His, sinoatrial (SA) node, bundle branches, Purkinje fibers
   b. Bundle of His, sinoatrial (SA) node, bundle branches, Purkinje fibers, atrioventricular (AV) node
   c. Purkinje fibers, bundle branches, bundle of His, sinoatrial (SA) node, atrioventricular (AV) node
   ✔ d. Sinoatrial (SA) node, atrioventricular (AV) node, bundle of His, bundle branches, Purkinje fibers

6. The function of coronary circulation is to:
   a. Regulate the cardiac cycle
   b. Deliver oxygenated blood from the lungs into systemic circulation
   ✔ c. Supply cardiac muscle with oxygenated blood and drain deoxygenated blood from it
   d. Drain excess blood from the ventricles

7. The layer of the heart wall primarily responsible for the heart's pumping action is the:
   ✔ a. Myocardium
   b. Endocardium
   c. Epicardium
   d. Pericardium

8. During _____, the ventricles contract and blood pumps out of the heart. During _____, the ventricles relax and blood flows into the heart.
   a. Diastole, systole
   ✔ b. Systole, diastole
   c. Inhalation, exhalation
   d. Cardiac circulation, pulmonary circulation

9. Cardiac output is determined from which of the following factors?
   a. Heart rate and blood pressure
   b. Oxygen consumption and carbon dioxide secretion
   ✔ c. Stroke volume and heart rate
   d. Ventricular contraction and venous return

10. The volume of blood, in liters, that each ventricle of the heart ejects every minute is known as:
    a. stroke volume
    ✔ b. cardiac output
    c. heart rate
    d. blood pressure

30.a. Blood Vessels and Circulation
Multiple Choice

1. Oxygenated blood flows from the heart through systemic circulation in which order?
   a. Arteries, veins, capillaries, arterioles, venules
   b. Veins, venules, capillaries, arterioles, arteries
   ✔ c. Arteries, arterioles, capillaries, venules, veins
   d. Capillaries, veins, venules, arterioles, arteries

2. Arteries are structurally different from veins in which way?
   a. They have thicker and stretchier walls to accommodate higher pressures
   b. They lack valves
   c. They have a tunica media
   ✔ d. a and b

3. The purpose of valves is to:
   a. Filter debris from the bloodstream
   ✔ b. Ensure unidirectional blood flow
   c. Move blood through arteries
   d. All of the above

4. When blood pressure increases, blood flow _____. When resistance increases, blood flow _____.
   a. Slows down, speeds up
   b. Stops, reverses
   ✔ c. Speeds up, slows down
   d. Reaches the extremities, moves into veins

5. The point of highest blood pressure is _____ pressure, and the point of lowest blood pressure is _____ pressure.
   a. Cardiac, systemic
   b. Diastolic, systolic
   c. Arterial, venous
   ✔ d. Systolic, diastolic

6. 120 mmHg, or millimeters of mercury, is the average _____ pressure for an adult.
   ✔ a. Systolic
   b. Diastolic
   c. Arterial
   d. Cardiac

7. Pulmonary veins carry _____, and pulmonary arteries carry _____.
   a. Deoxygenated blood, oxygenated blood
   b. More blood, less blood
   c. Nitrogenous wastes, oxygenated blood
   ✔ d. Oxygenated blood, deoxygenated blood

8. Which arteries supply the brain?
   a. Subclavian
   b. Intercostal
   ✔ c. Carotid
   d. Jugular

9. The _____ arteries supply the upper limbs, and the _____ arteries supply the lower limbs.
   a. Radial, mesenteric
   ✔ b. Axillary, femoral
   c. Iliac, gastric
   d. Aortic, popliteal

10. The superior and inferior mesenteric arteries primarily supply:
   a. The lungs
   b. The stomach
   ✔ c. The intestines
   d. The heart

11. The kidneys are supplied by the:
   a. Celiac trunk
   ✔ b. Renal arteries
   c. Tibial arteries
   d. Pancreaticoduodenal arteries

12. The major veins draining the head are the:
   a. Cephalic veins
   ✔ b. Jugular veins
   c. Brachiocephalic veins
   d. Facial veins

13. The iliac veins are located in which area of the body?
   a. Upper limbs
   b. Back
   c. Abdominal viscera
   ✔ d. Pelvic region

14. The first and last steps of systemic circulation are:
   ✔ a. Blood is pumped from the left ventricle into the aorta, blood drains from the superior and inferior venae cavae into the right atrium
   b. Blood is pumped from the right atrium into the superior vena cava, blood drains from the aorta into the left ventricle
   c. Blood drains into the venae cavae, blood leaves the aorta
   d. Blood flows through the pulmonary valve, blood returns through the bicuspid valve

15. In systemic circulation, oxygenated blood is pumped from the heart into _____, which carry it to body tissues. _____ carry deoxygenated blood back to the heart.
   a. Vessels, Cells
   b. Veins, Arteries
   ✔ c. Arteries, Veins
   d. Valves, Capillaries

Lymphatic System

32.a. Lymphatic System Multiple Choice

1. As water and substances are exchanged between tissues and the bloodstream, unwanted substances enter the lymphatic network and travel towards:
   ✔ a. Nodes
   b. The thymus
   c. Kidneys
   d. The liver

2. The following are examples of lymphatic vessels and tissues, except:
   a. Thoracic duct
   ✔ b. Thyroid
   c. Spleen
   d. Thymus

3. The thoracic duct, or left lymphatic duct, begins at the _____ and collects lymph from the left upper body and the entire body beneath the ribs.
   ✔ a. Cisterna chyli
   b. Lymphatic capillaries
   c. Jugular trunk
   d. Thymus

4. Lymph trunks are major lymphatic vessels that empty into the thoracic duct and _____
   a. Lymphatic capillaries
   ✔ b. Right lymphatic duct
   c. Left lymphatic duct
   d. Cisterna chyli

5. The stem cells that give rise to B lymphocytes are produced in:
   a. Thymus gland
   b. Compact bone
   ✔ c. Red bone marrow
   d. Spleen

6. _____ are lymphocytes that develop and mature in the thymus. After maturing, they leave the thymus and colonize lymphatic tissues like the spleen and lymph nodes.
   ✔ a. T cells
   b. Stem cells
   c. Macrophages
   d. B cells

7. Inside the spleen, abnormal blood cells are consumed by _____, and lymphocytes carry out immune responses.
   a. Lymph vessels
   b. Stem cells
   c. T cells
   ✔ d. Macrophages

8. Lymph nodes are capsules of tissue that filter lymph and contain lymphocytes that destroy:
   a. Tissue
   b. Antibodies
   ✔ c. Pathogens
   d. Platelets

9. Lymph nodes are clustered in areas where the head and limbs meet the torso and near the
   a. Diaphragm
   ✔ b. Intestines
   c. Pelvic girdle
   d. Kidneys

10. Lymph enters lymph nodes through the afferent vessels, and passes through the following structures inside the node, except:
    a. Subscapular sinus
    b. Trabecula
    c. Medullary sinus
    ✔ d. Efferent vessels

33.a. Immunity Multiple Choice

1. Innate immunity provides a fast and general defense against invading:
   ✔ a. Pathogens
   b. Lymphocytes
   c. T cells
   d. B cells

2. Inflammation around the site of injury releases chemicals that attract macrophages and other _____ from the bloodstream.
   a. Red blood cells
   b. Lymph
   ✔ c. White blood cells
   d. Pathogens

3. The innate immune response is a general response involving the following, except:
   a. Physical defenses
   ✔ b. Interstitial fluid
   c. Antimicrobial substances
   d. Fever and inflammation

4. _____ is an example of something that provides a physical barrier to invading pathogens.
   a. Red blood cells
   b. Lymphocytes
   c. Spongy bone
   ✔ d. Skin

5. The following are examples of white blood cells, except:
   a. Basophils
   b. Monocytes
   c. Neutrophils
   ✔ d. Erythrocytes

6. White blood cells called _____ work to consume bacteria.
   ✔ a. Neutrophils
   b. Eosinophils
   c. Basophils
   d. Lymphocytes

7. When bacteria or other pathogens are present in the body, cells called _____ consume the microorganisms to protect the body from infection.
   a. Lysosomes
   ✔ b. Phagocytes
   c. Basophils
   d. T cells

8. The adaptive immune response is a targeted response in which _____ lymphocytes recognize and neutralize invading microbes in the lymphatic system and bloodstream.
   a. B and NK
   b. NK and T
   c. A and T
   ✔ d. B and T

9. B cells produce _____, substances that recognize the antigens on foreign microbes and act as tags that identify the invaders.
   ✔ a. Antibodies
   b. Antigens
   c. Macrophages
   d. Monocytes

10. Once activated by _____, the substances on foreign microbes, T cells seek out and destroy infected cells.
    a. Pathogens
    b. Lymph
    ✔ c. Antigens
    d. Antimicrobial substances

Respiratory System

35.a. Upper Respiratory System Multiple Choice

1. The components of the upper respiratory system are:
   a. Nasal cavity, larynx
   ✔ b. Nasal cavity, pharynx, larynx
   c. Pharynx, trachea, bronchi
   d. Larynx, lungs, nose

2. All of the following can be found in the nasal cavity, except:
   a. Olfactory receptors
   b. Mucosa
   c. Conchae
   ✔ d. Cartilaginous rings

3. Which parts of the pharynx are shared with the digestive system?
   a. Nasopharynx, laryngopharynx
   b. Oropharynx only
   c. Oropharynx, nasopharynx
   ✔ d. Oropharynx, laryngopharynx

4. Olfactory receptors are activated by which of the following?
   ✔ a. Chemicals in the air
   b. Nerve impulses from the medulla
   c. Inhalation and exhalation
   d. Nasal mucus

5. Which best describes the pathway of an olfactory nerve impulse?
   a. Olfactory tracts, olfactory bulb, olfactory receptors, cerebral cortex
   ✔ b. Olfactory receptors, olfactory bulb, olfactory tracts, cerebral cortex
   c. Olfactory bulb, olfactory tracts, cerebral cortex
   d. Olfactory tracts, olfactory bulb, nasal mucosa

6. How is air modified as it passes over the nasal mucosa?
   a. Particles are filtered out by mucus and coarse hairs
   b. Bacteria are destroyed by antibiotics secreted by seromucous glands
   c. Air is warmed by capillaries
   ✔ d. All of the above

7. The buildup of pressure in the lungs during a sneeze functions to:
   ✔ a. Propel irritants forcefully out of the nasal cavity
   b. Draw mucus into the pharynx
   c. Facilitate inhalation
   d. Inhibit the reflex arc

8. The main function of the epiglottis is to:
   a. Produce sound during phonation
   b. Filter air passing through the oropharynx
   ✔ c. Close off the trachea to direct food into the esophagus
   d. Begin the process of peristalsis

9. Which of the following statements about phonation are true?
   i. Sound is produced by vibration of the vocal cords
   ii. Muscles move the arytenoid cartilages to control the vocal cords
   iii. Pitch is determined only by vocal cord length
   iv. Higher air pressure creates louder sound

   ✔ a. i, ii, and iv
   b. i and iv
   c. i, ii, iii, and iv
   d. i only

10. Which would you expect to produce the highest pitched sound?
    a. Long vocal cords, low air pressure
    b. Short vocal cords, low vocal cord tension, high air pressure
    c. Long vocal cords, high vocal cord tension
    ✔ d. Short vocal cords, high vocal cord tension

36.a. Lower Respiratory System Multiple Choice

1. The components of the lower respiratory system are:
   ✔ a. Trachea, bronchi, bronchioles, lungs
   b. Pharynx, larynx, trachea, lungs
   c. Larynx, trachea, bronchi, lungs
   d. Bronchi and lungs

2. What is the purpose of the trachea's cartilaginous rings?
   a. Support the trachea and keep it from collapsing or overexpanding
   b. Push air along the length of the trachea by peristalsis
   c. Give the trachea flexibility to allow passage of food through the esophagus
   ✔ d. a and c

3. When smooth muscles in the bronchi relax, _____ occurs and ventilation usually _____.
   a. Bronchodilation, decreases
   b. Bronchoconstriction, decreases
   ✔ c. Bronchodilation, increases
   d. Bronchoconstriction, increases

4. The branches of the bronchial tree, from widest to narrowest, are:
   a. Bronchioles, primary bronchi, secondary bronchi, tertiary bronchi
   ✔ b. Primary bronchi, secondary bronchi, tertiary bronchi, bronchioles
   c. Tertiary bronchi, secondary bronchi, primary bronchi, bronchioles
   d. Secondary bronchi, tertiary bronchi, primary bronchi, bronchioles

5. The right lung has _____ lobes, and the left lung has _____ lobes.
   a. 2, 3
   b. 3, 3
   c. 2, 2
   ✔ d. 3, 2

6. Which best describes the path that deoxygenated blood travels from the heart into the lungs?
   a. Pulmonary trunk, pulmonary arteries, pulmonary veins
   ✔ b. Right ventricle, pulmonary trunk, pulmonary arteries, capillaries
   c. Pulmonary arteries, capillaries, pulmonary veins, left atrium
   d. Right ventricle, pulmonary veins, capillaries

7. In gas exchange (external respiration):
   ✔ a. Oxygen diffuses from alveoli into capillaries, carbon dioxide diffuses from capillaries into alveoli
   b. Carbon dioxide diffuses from alveoli into capillaries, oxygen diffuses from capillaries into alveoli
   c. Oxygen and carbon dioxide is carried from alveoli into the bronchioles
   d. Oxygen is chemically transformed into carbon dioxide within the alveoli

8. The function of Type II alveolar cells is to:
   a. Exchange oxygen and carbon dioxide
   ✔ b. Produce alveolar fluid
   c. Remove particulate debris
   d. All of the above

9. Why is surfactant in alveolar fluid important?
   a. It facilitates particle absorption
   b. It exchanges oxygen and carbon dioxide
   c. It produces antibiotics that clean the alveolar surface
   ✔ d. It reduces surface tension so that alveoli can maintain their shape

10. Gas exchange in external respiration occurs in which cells?
    ✔ a. Type I alveolar cells
    b. Type II alveolar cells
    c. Alveolar macrophages
    d. None of the above

37.a. Respiration Multiple Choice

1. Which muscles are used during normal inhalation?
   a. Internal intercostals, external intercostals
   b. Scalenes, pectoralis minor
   c. Abdominals, transversus thoracis
   ✔ d. Diaphragm, external intercostals

2. All of the following muscles are used during forced inhalation, except:
   ✔ a. Internal oblique
   b. External intercostals
   c. Sternocleidomastoid
   d. Scalenes

3. During normal exhalation, which of the following muscles contract?
   a. Diaphragm, external intercostals
   b. Internal intercostals, transversus thoracis
   ✔ c. None; the muscles of inhalation relax in normal exhalation
   d. Abdominals

4. In forced exhalation, the _____ muscles compress the trunk.
   a. External intercostals
   b. Pectoralis
   ✔ c. Abdominal
   d. Serratus

5. Respiratory rhythm is regulated by which of the following brain structures?
   ✔ a. Medulla oblongata
   b. Limbic system
   c. Cerebral cortex
   d. Thalamus

6. Why does air move out of the lungs during exhalation?
   a. Smooth muscle forces the air out through the trachea
   b. Relaxation of the diaphragm makes the lungs expand
   ✔ c. Pressure inside the lungs is higher than atmospheric pressure
   d. b and c

7. Which accurately describes Boyle's Law?
   a. Carbon dioxide and oxygen exert their pressures independently
   b. Pressure inside the lungs remains constant
   c. When the volume of a container decreases, pressure of a gas inside decreases
   ✔ d. When the volume of a container increases, pressure of a gas inside decreases

8. According to Dalton's Law, oxygen and carbon dioxide are exchanged between the alveoli and the bloodstream because:
✔ a. Each gas diffuses to the area of its lower partial pressure
b. The changing volume of the lungs creates a pressure differential
c. Oxygen is attracted to hemoglobin in the blood
d. Waste carbon dioxide is expelled more forcefully

9. The circulatory system works with the respiratory system to maintain body function by doing which of the following?
i. Chemically filtering incoming air
ii. Transporting oxygen in hemoglobin
iii. Pressurizing the alveolar membrane
iv. Delivering waste carbon dioxide to pulmonary capillaries
a. i and ii
✔ b. ii and iv
c. ii, iii, and iv
d. ii only

10. Which of the following would cause the medulla oblongata to increase respiratory rate?
a. Too much oxygen in the bloodstream
✔ b. Too much carbon dioxide in the bloodstream
c. Decrease in metabolic needs
d. None of the above

Digestive System

39.a. Oral Cavity Multiple Choice

1. Food is broken down mechanically in the oral cavity by:
a. Teeth
b. Tongue
c. Saliva
✔ d. a and b

2. Which of the following muscles is not involved in mastication?
a. Lateral pterygoid
b. Temporalis
✔ c. Mentalis
d. Deep masseter

3. When you bite the tip off of a carrot, you use the sharp, front teeth adapted for cutting. These would be the:
a. Premolars
✔ b. Incisors
c. Molars
d. Canines

4. If the epiglottis fails to perform its main function, which of the following is likely to occur?
✔ a. Choking
b. Vomiting
c. Acid reflux
d. Drooling

5. The substance that encloses the pulp cavity inside a tooth is called:
a. Cementum
✔ b. Dentin
c. Enamel
d. Gingiva

6. Which of the following is not true about the tongue?
a. Its surface contains papillae
b. It is anchored by extrinsic tongue muscles
✔ c. It depresses during swallowing
d. It manipulates the bolus

7. What percentage of saliva is water?
a. 85%
b. 90%
c. 95%
✔ d. Over 99%

8. The four layers of the digestive tract, from innermost to outermost, are the:
✔ a. Mucosa, submucosa, muscularis, serosa
b. Serosa, muscularis, submucosa, mucosa
c. Submucosa, mucosa, muscularis, serosa
d. Muscularis, submucosa, serosa, mucosa

9. The alimentary canal consists of the:
a. Esophagus, stomach, small intestine, large intestine
b. Stomach, small intestine, large intestine
✔ c. Oral cavity, pharynx, esophagus, stomach, small intestine, large intestine
d. Pharynx, esophagus, stomach, small intestine, large intestine

10. The hard palate is located at the base of the:
a. Zygomatic
b. Ethmoid
c. Mandible
✔ d. Maxilla

40.a. Esophagus and Stomach Multiple Choice

1. The smooth muscle of the digestive tract pushes food forward in contractile waves called:
   a. Churning
   ✔ b. Peristalsis
   c. Deglutition
   d. Haustral contractions

2. The esophagus lies _____ to the _____ and extends from the _____ to the _____.
   a. Anterior, trachea, oral cavity, pyloric sphincter
   b. Lateral, trachea, laryngopharynx, cardiac sphincter
   ✔ c. Posterior, trachea, laryngopharynx, cardiac sphincter
   d. Anterior, trachea, oropharynx, duodenum

3. The only muscle the esophagus passes through is the:
   a. Transversus thoracis
   b. Sternothyroid
   c. Internal oblique
   ✔ d. Diaphragm

4. The bulge in the superior region of the stomach is known as the:
   ✔ a. Fundus
   b. Cardia
   c. Body
   d. Pylorus

5. The third muscular layer found in the stomach wall (but not in the rest of the alimentary canal) is the:
   a. Longitudinal
   b. Circular
   ✔ c. Oblique
   d. Smooth

6. Gastric juice contains which type of acid?
   a. Lactic
   b. Sulfuric
   ✔ c. Hydrochloric
   d. Phosphoric

7. Food enters the stomach through the _____ sphincter, and chyme exits through the _____ sphincter.
   a. Pyloric, cardiac
   ✔ b. Cardiac, pyloric
   c. Iliocecal, pyloric
   d. Cardiac, iliocecal

8. Which arteries supply the lesser curvature of the stomach?
   ✔ a. Gastric
   b. Gastroepiploic
   c. Hepatic
   d. Cystic

9. The mixing process that takes place in the stomach is known as:
   a. Peristalsis
   b. Deglutition
   ✔ c. Churning
   d. Mass movements

10. The greater curvature of the stomach is drained by which veins?
    a. Gastric
    ✔ b. Gastroepiploic
    c. Hepatic
    d. Cystic

41.a. Accessory Organs Multiple Choice

1. All of the following are segments of the liver, except:
   a. The caudate lobe
   b. The left posterolateral segment
   ✔ c. The right quadrate segment
   d. The anteromedial segment

2. Bile flows from the liver to the gall bladder along which pathway?
   a. Hepatic duct, common hepatic duct, common bile duct, gall bladder
   b. Common hepatic duct, common bile duct, cystic duct
   c. Common bile duct, hepatic duct, common hepatic duct, gall bladder
   ✔ d. Hepatic duct, common hepatic duct, cystic duct, gall bladder

3. The main pancreatic duct empties into the duodenum at the same place as the:
   ✔ a. Common bile duct
   b. Accessory pancreatic duct
   c. Common hepatic duct
   d. Cystic duct

4. The main role of bile salts in digestion is to:
   a. Break down proteins
   ✔ b. Emulsify fats
   c. Lubricate the digestive tract
   d. Buffer gastric juice

5. The main function of the hepatic portal system is to:
   a. Drain deoxygenated blood from the liver
   b. Supply the liver with oxygenated blood
   ✔ c. Drain blood from the digestive tract into the liver for processing
   d. Supply blood into the digestive tract

6. Bile is produced by the _____ and stored by the _____ until it drains into the _____.
   a. Gall bladder, liver, duodenum
   b. Pancreas, liver, gall bladder
   ✔ c. Liver, gall bladder, duodenum
   d. Liver, gall bladder, stomach

7. The ligament that separates the right and left lobes on the anterior surface of the liver is the:
   ✔ a. Falciform ligament
   b. Ligamentum teres
   c. Coronary ligament
   d. Ligamentum venosum

8. The gall bladder is located on the _____ and _____ side of the liver.
   a. Superior, right
   ✔ b. Inferior, right
   c. Inferior, left
   d. Posterior, left

9. Pancreatic juice contains _____ and _____ that aid digestion in the _____.
   a. Enzymes, ions, pancreas
   b. Acids, enzymes, small intestine
   c. Bicarbonate salts, acids, stomach
   ✔ d. Ions, enzymes, small intestine

10. Branches of the _____ and _____ arteries supply the liver and gall bladder with oxygenated blood, while branches of the _____ and _____ arteries supply the pancreas.
    a. Gastroduodenal, proper hepatic, cystic, splenic
    ✔ b. Proper hepatic, cystic, splenic, gastroduodenal
    c. Cystic, splenic, proper hepatic, gastroduodenal
    d. Splenic, gastroduodenal, cystic, proper hepatic

42.a. Small and Large Intestines Multiple Choice

1. Which structural features of the small intestine facilitate nutrient absorption?
   a. Circular folds
   b. Villi
   c. Greater length relative to other gastrointestinal tract regions
   ✔ d. All of the above

2. The function of mucus in intestinal juices is to:
   a. Break down all components of chyme
   ✔ b. Protect the intestinal lining
   c. Emulsify fats
   d. Dissolve carbohydrates for absorption

3. From the stomach to the large intestine, the regions of the small intestine are the:
   a. Jejunum, ileum, duodenum
   b. Ileum, jejunum, duodenum
   c. Duodenum, ileum, jejunum
   ✔ d. Duodenum, jejunum, ileum

4. From the small intestine to the anal canal, the regions of the large intestine are the:
   ✔ a. Cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum
   b. Ascending colon, descending colon, transverse colon, sigmoid colon, cecum, rectum
   c. Cecum, ascending colon, descending colon, transverse colon, sigmoid colon, rectum
   d. Transverse colon, sigmoid colon, ascending colon, descending colon, rectum

5. The _____ are bulges in the large intestine formed by the _____.
   a. Taenia coli, haustra
   b. Circular folds, taenia coli
   ✔ c. Haustra, taenia coli
   d. Haustral contractions, mass movements

6. Chyme passes from the small intestine into the large intestine through the _____ valve.
   a. Pyloric
   b. Cardiac
   c. Duodenal
   ✔ d. Ileocecal

7. Chyme is moved through the large intestine by:
   a. Deglutition
   b. Peristalsis
   c. Haustral churning
   ✔ d. b and c

8. Which of the following vitamins is released by bacteria in the colon?
   a. C
   b. A
   ✔ c. B
   d. D

9. The main component of chyme absorbed in the large intestine is:
   a. Vitamin K
   ✔ b. Water
   c. Protein
   d. Carbohydrates

10. Relaxation of the _____ is an involuntary result of the defecation reflex.
    ✔ a. Internal anal sphincter
    b. Rectum
    c. External anal sphincter
    d. Anal canal

Urinary System

44.a. Kidney Multiple Choice

1. The kidneys are located approximately between the levels of which two vertebrae?
   a. T6 and T8
   b. T7 and T12
   ✔ c. T12 and L3
   d. C3 and C7

2. Because of their position between the posterior abdominal wall and the peritoneum, the kidneys are said to be:
   a. Intraperitoneal
   ✔ b. Retroperitoneal
   c. Subperitoneal
   d. Infraperitoneal

3. The renal pyramids of the kidneys are contained within the:
   ✔ a. Renal medulla
   b. Renal cortex
   c. Renal pelvis
   d. Renal sinuses

4. The primary function of the renal pelvis is to:
   a. Produce urine through filtration
   b. Supply blood to the kidney
   c. Reabsorb water and nutrients
   ✔ d. Funnel urine into the ureter

5. Blood enters each kidney through the _____.
   a. Glomerulus
   ✔ b. Renal artery
   c. Renal vein
   d. Capillaries

6. A nephron is a tiny structure in the kidneys that _____.
   a. Produces urine
   b. Stimulates the pituitary gland
   ✔ c. Filters blood
   d. Moves urine

7. Which of the following is not part of a nephron?
   ✔ a. Collecting duct
   b. Glomerulus
   c. Distal convoluted tubule
   d. Nephron loop

8. Filtration occurs in which part of the nephron?
   a. Proximal convoluted tubule
   b. Nephron loop
   ✔ c. Glomerulus
   d. b and c

9. The nephron does all of the following except:
   a. Reabsorb water
   b. Produce urine
   ✔ c. Filter solutes
   d. Secrete waste

10. Blood from the branches of the renal artery is filtered by nephrons in the _____.
    a. Proximal convoluted tubule
    b. Glomerulus
    ✔ c. Renal pyramids
    d. Distal convoluted tubule

45.a. Urine Production Multiple Choice

1. Glomerular filtration occurs because the blood pressure inside glomerular capillaries is _____ the pressure in the surrounding capsule.
   a. Lower than
   ✔ b. Higher than
   c. Equal to
   d. Controlled by

2. Which of the following does not typically pass through the glomerular filtration membrane?
   a. Water
   b. Solutes
   ✔ c. Blood cells
   d. All pass through

3. As the filtrate passes out of the glomerular capsule and through the renal tubule, substances like the following are reabsorbed into the body through cells along the tube wall, except:
   a. Glucose
   b. Amino acids
   ✔ c. Blood
   d. Proteins

4. Water is conserved through the process of:
   a. Secretion
   b. Filtration
   c. Micturition
   ✔ d. Reabsorption

5. Waste products pass from the bloodstream into urine through:
   a. Glomerular filtration only
   b. Reabsorption
   ✔ c. Glomerular filtration and secretion
   d. Secretion only

6. Normal urine is composed of about 95%:
   a. Urea
   ✔ b. Water
   c. Nitrogenous wastes
   d. Uric acid

7. In males, the urethra is divided into how many regions?
   a. 1
   b. 2
   ✔ c. 3
   d. 4

8. When water intake is high, excess water is filtered from blood into urine and expelled from the body in what?
✔ a. Diluted urine
b. Concentrated urine
c. Sweat
d. None of the above

9. Concentrated urine forms as a result of:
a. Greater secretion
b. Higher glomerular filtration rate
✔ c. Increased reabsorption
d. Decreased reabsorption

10. Which would be most likely to cause impaired kidney function?
✔ a. Acute dehydration
b. High blood pressure
c. Anemia
d. Concussion

46.a. Urine Storage and Elimination Multiple Choice

1. Which best describes the pathway of urine from the kidneys out of the body?
a. Renal pelvis, bladder, ureters, urethra
b. Ureters, renal pelvis, bladder, urethra
✔ c. Renal pelvis, ureters, bladder, urethra
d. Bladder, ureters, renal pelvis, urethra

2. Which of the following does not form one of the angles of the trigone?
a. Left ureteral orifice
b. Right ureteral orifice
c. Internal urethral orifice
✔ d. External urethral orifice

3. During the micturition reflex, the internal urethral sphincter _____ and the detrusor muscle _____.
a. Contracts, relaxes
✔ b. Relaxes, contracts
c. Contracts, contracts
d. Relaxes, relaxes

4. Which of the following statements about micturition is not true?
a. It is a reflex
b. Both urethral sphincters must be relaxed for it to take place
✔ c. The internal urethral sphincter can be voluntarily controlled
d. Stretch receptors in the bladder wall signal the need to micturate

5. From proximal to distal, the regions of the male urethra are:
✔ a. Prostatic, membranous, spongy
b. Membranous, prostatic, spongy
c. Spongy, prostatic, membranous
d. Prostatic, spongy, membranous

6. In females, the bladder is located _____ to the uterus and _____ to the vagina.
a. Superior, anterior
✔ b. Inferior, anterior
c. Superior, lateral
d. Inferior, medial

7. The male urethra extends from the _____ through the prostate and out the penis.
✔ a. Bladder neck
b. Kidneys
c. Detrusor muscle
d. Glomerulus

8. Voluntary control of micturition involves which nervous system structure(s)?
a. Spinal cord only
b. Spinal cord and thalamus
c. Stretch receptors and spinal cord
✔ d. Spinal cord, thalamus, and cerebral cortex

9. The male bladder is located in front of the rectum and:
✔ a. Superior to the prostate gland
b. Inferior to the prostate gland
c. Superior to the kidneys
d. Inferior to the deep transverse perineal

10. Incontinence is usually caused by lack of control over which structure?
a. Internal urethral sphincter
✔ b. External urethral sphincter
c. Detrusor muscle
d. Trigone

Reproductive System

48.a. Male Reproductive System Multiple Choice

1. Sperm are produced in the _____ and stored in the _____.
a. Epididymis, testes
b. Seminal vesicles, prostate
c. Testes, seminal vesicles
✔ d. Testes, epididymis

2. In spermatogenesis, sperm cells develop from stem cells through a series of intermediate steps. Which best describes the order of development?
   a. Spermatogonium, spermatids, secondary spermatocytes, primary spermatocytes
   ✔ b. Spermatogonium, primary spermatocytes, secondary spermatocytes, spermatids
   c. Spermatids, secondary spermatocytes, primary spermatocytes, spermatogonium
   d. Spermatogonium, secondary spermatocytes, primary spermatocytes, spermatids

3. Mature sperm cells have _____ chromosomes, because they have undergone _____ during their development.
   a. 46, mitosis
   b. 23, only mitosis
   c. 46, meiosis
   ✔ d. 23, meiosis

4. A sperm cell's genetic information is contained in the _____.
   a. Acrosome
   ✔ b. Head
   c. Midpiece
   d. Tail

5. Semen is composed of spermatozoa and secretions from which of the following?
   a. Prostate gland only
   b. Seminal vesicles only
   ✔ c. Prostate gland, seminal vesicles, and bulbourethral glands
   d. Seminal vesicles and bulbourethral glands

6. Which best describes the path of sperm from the testes to the exterior of the body?
   ✔ a. Testes, epididymis, vas deferens, ejaculatory ducts, prostatic urethra, membranous urethra, spongy urethra
   b. Testes, ejaculatory ducts, epididymis, vas deferens, prostatic urethra, membranous urethra, spongy urethra
   c. Testes, epididymis, ejaculatory ducts, spongy urethra, prostatic urethra, membranous urethra
   d. Testes, epididymis, vas deferens, ejaculatory ducts, membranous urethra, prostatic urethra, spongy urethra

7. During an erection, the penis becomes and stays rigid because arteries in the penis _____ and veins in the penis _____.
   a. Constrict, dilate
   ✔ b. Dilate, are compressed
   c. Contract, expand
   d. Compress veins, dilate

8. The erectile tissues of the penis are the _____ and the _____.
   a. Corpora cavernosa, tunica albuginea
   b. Dartos, glans
   ✔ c. Corpus spongiosum, corpora cavernosa
   d. Bulbospongiosus, corpus spongiosum

9. The three sections of the male urethra, from innermost to outermost, are the:
   ✔ a. Prostatic, membranous, spongy
   b. Membranous, prostatic, spongy
   c. Spongy, membranous, prostatic
   d. Prostatic, spongy, membranous

10. Which of the following is not a male reproductive gland?
    a. Vas deferens
    b. Seminal vesicle
    c. Epididymis
    ✔ d. a and c

49.a. Female Reproductive System
Multiple Choice

1. Female sex cells develop in the _____ and are released into the _____.
   a. Uterus, ovaries
   ✔ b. Ovaries, uterus
   c. Ovaries, uterine tubes
   d. Uterine tubes, uterus

2. In oogenesis, stem cells develop into female sex cells in this order:
   a. Primary oocytes, oogonium, secondary oocytes
   b. Primary oocytes, secondary oocytes, oogonium
   ✔ c. Oogonium, primary oocytes, secondary oocytes
   d. Ovum, primary oocytes, oogonium

3. A secondary oocyte has _____ chromosomes.
   ✔ a. 23
   b. 46
   c. 64
   d. 92

4. When is meiosis II completed in female sex cells?
   a. Birth
   b. Menarche
   ✔ c. Fertilization
   d. Implantation

5. A spike in LH levels triggers which of the following?
   a. Menstruation
   ✔ b. Ovulation
   c. Implantation
   d. Follicular phase

6. A follicle in the ovary develops and _____ at the same time that the lining of the uterus thickens.
   ✔ a. Releases a secondary oocyte
   b. Triggers the secretory phase
   c. Triggers the menstrual phase
   d. Extends the uterine tube

7. When fertilization and implantation occur, which of the following things happen in the next cycle?
   a. Menstrual phase
   ✔ b. Maintenance of estrogen and progesterone levels
   c. Ovulation
   d. a and c

8. Lactation is controlled by all of the following hormones, except:
   a. Progesterone
   ✔ b. Luteinizing hormone
   c. Prolactin
   d. Oxytocin

9. Higher levels of estrogen and progesterone during pregnancy stimulate the:
   a. Secretory phase
   b. Proliferative phase
   c. Release of a secondary oocyte
   ✔ d. Thickening of the uterine lining

10. The _____ contains erectile tissue and is homologous to the penis in males.
    a. Vagina
    ✔ b. Clitoris
    c. Cervix
    d. Labia minora

50.a. Sexual Reproduction and Development Multiple Choice

1. Fertilization usually occurs in the:
   a. Uterus
   b. Vagina
   ✔ c. Uterine tube
   d. Cervix

2. A newly fertilized oocyte is called a:
   a. Gamete
   b. Morula
   c. Blastocyst
   ✔ d. Zygote

3. After fertilization, the oocyte undergoes mitosis and develops from a _____ into a _____ as it moves toward the uterus.
   a. Blastocyst, zygote
   ✔ b. Zygote, morula
   c. Morula, zygote
   d. Zygote, blastocyst

4. When the fertilized oocyte has developed into _____, it implants on the uterine wall.
   a. A zygote
   b. A morula
   c. An embryo
   ✔ d. A blastocyst

5. If a fertilized egg has a Y chromosome, all of the following are true except:
   a. The sperm that fertilized the egg was carrying a Y chromosome
   ✔ b. The embryo will develop male characteristics in the first 2–3 weeks
   c. The production of testosterone will trigger genital development
   d. At birth, the infant will be male

6. The primary hormone that regulates labor contractions is:
   a. Estrogen
   b. Progesterone
   c. Relaxin
   ✔ d. Oxytocin

7. By week _____ the embryo is a fetus.
   a. 12
   ✔ b. 10
   c. 20
   d. 4

8. The term *menarche* refers to:
   a. The onset of puberty
   ✔ b. The first reproductive cycle
   c. The end of the uterine cycle
   d. The period of female fertility

9. A woman's ovarian cycle lasts for about _____ days.
   a. 5
   b. 15
   ✔ c. 28
   d. 38

10. For men, testosterone decline usually begins after the age of:
    a. 40
    b. 60
✔ c. 50
    d. 70

11. It takes about _____ days for the fertilized egg to reach the uterus from the ovary.
    a. 10
    b. 15
    c. 20
✔ d. 5

12. When the fertilized egg has become a hollow ball containing a few hundred cells, it is called:
✔ a. A blastocyst
    b. A fetus
    c. A zygote
    d. An oocyte

13. About 15 days after conception, some of the blastocyst cells will begin to develop into part of the:
✔ a. Placenta
    b. Endometrium
    c. Zygote
    d. Ovary

14. Implantation occurs when the:
    a. Egg is fertilized
✔ b. Blastocyst attaches to the uterine lining
    c. Cells of the zygote divide and multiply
    d. Fertilized zygote passes from the uterine tube to the uterus

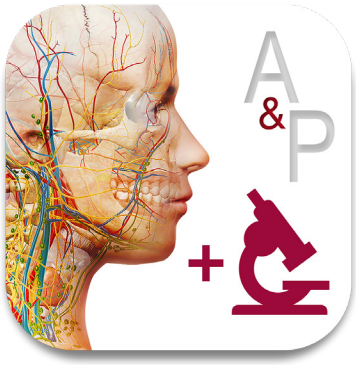
15. All of the following statements accurately describe neurulation, except:
    a. It occurs when a portion of the dorsal ectoderm thickens
    b. It is the first major event of organogenesis
✔ c. It occurs when the blastocyst attaches to the uterine lining
    d. It occurs in week 5 of embryonic growth

16. The anterior end of the neural tube forms the _____ and the rest forms the _____.
    a. Heart, brain
✔ b. Brain, spinal cord
    c. Lungs, spinal cord
    d. Heart, lungs

17. Growth of the fetus is supplied by nutrients passing from the mother's blood in the placenta into the:
    a. Uterus
✔ b. Umbilical cord
    c. Uterine tube
    d. Cervix

18. By the fourth week of development, the embryo is an oblong body, and before becoming a fetus, it further develops all of the following, except:
    a. Limbs
✔ b. Vertebrae
    c. Organs
    d. Skin

Practice Quizzes: Dissection Quizzes



Cells and Tissue

Quiz 2.b. Cell Structure and Function

- Select any part of the plasma membrane.
- Select any part of the cytosol.
- Select any part of the nucleus.
- Select any part of a mitochondrion.
- Select any part of the smooth endoplasmic reticulum.
- Select a ribosome.
- Select any part of the golgi complex.
- Select any part of the rough endoplasmic reticulum.
- Select the pericentriolar material.
- Select a lysosome or peroxisome.
- Select the nucleolus.
- Select the nuclear envelope.
- Select any part of a centriole.
- Select any part of the cytoskeleton.

Integumentary System

Quiz 6.b. Integumentary System

- Select the dermis.
- Select a sweat gland.
- Select any tactile sensory receptor.
- Select a hair follicle or root.
- Select a sebaceous (oil) gland.
- Select any part of the hypodermis.
- Select the stratum basale.
- Select the stratum spinosum.
- Select the stratum granulosum.
- Select the stratum corneum.

Skeletal System and Joints

Quiz 10.b. Axial Skeleton

- Select a cranial bone.
- Select the right or left zygomatic bone.
- Select any part of the sphenoid.
- Select the right or left temporal bone.
- Select the occipital bone.
- Select the right or left maxilla.
- Select any part of the ethmoid.
- Select the hyoid.
- Select the atlas.
- Select a lumbar vertebra.
- Select a thoracic vertebra.
- Select a cervical vertebra.
- Select a true rib.
- Select a false rib.
- Select the manubrium.
- Select the body of the sternum.

Quiz 11.b. Appendicular Skeleton

- Select the right or left scapula.
- Select a bone of the arm.
- Select one of the carpal bones.
- Select the right or left first proximal phalanx of the hand.
- Select the right or left ilium.
- Select the right or left pubis.
- Select the right or left tibia.
- Select the right or left femur.
- Select the right or left patella.
- Select the right or left fibula.
- Select a metatarsal bone.
- Select the right or left radius.
- Select the right or left ulna.
- Select the right or left ischium.
- Select the right or left clavicle.

Quiz 12.b. Joints

- Select a bone that makes up part of a ball-and-socket joint.
- Select the bone that articulates with the atlas in a pivot joint.
- Select the pubic symphysis.
- Select the bone that articulates with the carpals in a condyloid joint.
- Select the anterior cruciate ligament of the knee.
- Select one of the collateral ligaments of the knee.
- Select a bone in the wrist that is part of a gliding joint.
- Select a ligament of the hip joint.
- Select a ligament of the shoulder joint.
- Select a bone that makes up part of the skull's only synovial joint.

Muscle Tissue and Muscular System

Quiz 15.b. Smooth and Cardiac Muscle Tissue

- Select the esophagus.
- Select any part of the small or large intestine.
- Select the trachea.
- Select the bladder.

- Select the oblique muscle layer of the stomach.
- Select the myocardium.
- Select any part of the cardiac conduction system.
- Select an artery that supplies cardiac muscle.

Quiz 16.b. Muscular System

- Select the muscle that acts as the primary agonist of elbow flexion.
- Select any part of the muscle that acts as the primary antagonist of elbow flexion.
- Select the bone that serves as the insertion for the biceps brachii.
- Select one of the muscles of mastication.
- Select any part of the right or left longissimus.
- Select any part of the right or left levator ani.
- Select the right or left trapezius.
- Select any muscle of the rotator cuff.
- Select the right or left extensor digitorum of the hand.
- Select the right or left internal oblique.
- Select the right or left gluteus medius.
- Select any of the lateral rotators of the thigh.
- Select the right or left rectus femoris.
- Select the right or left adductor magnus.
- Select any muscle of the hamstrings.
- Select the right or left gastrocnemius.

Nervous System and Special Senses

Quiz 19.b. Spinal Cord and Spinal Nerves

- Select a dorsal root ganglion of a thoracic nerve.
- Select a ventral root of a cervical nerve.
- Select a dorsal root of a lumbar nerve.
- Select the right or left sciatic nerve.
- Select the right or left axillary nerve.
- Select the right or left phrenic nerve.
- Select a cord of the brachial plexus.
- Select the right or left femoral nerve.
- Select a nerve of the cervical plexus.
- Select any part of the right or left radial nerve.
- Select the right or left medial or lateral pectoral nerve.
- Select a trunk of the brachial plexus.
- Select the right or left ulnar nerve.
- Select a root of a sacral nerve.

Quiz 20.b. Brain

- Select any part of the medulla oblongata.
- Select any part of the pons.
- Select any part of the midbrain.
- Select any part of the cerebellum.
- Select the right or left frontal lobe of the cerebral cortex.
- Select the right or left precentral gyrus.
- Select a ventricle of the brain.
- Select the hypothalamus.
- Select the right or left thalamus.
- Select any part of the limbic system.
- Select any part of the basal ganglia.
- Select the right or left temporal lobe of the cerebral cortex.
- Select any part of the pituitary gland.
- Select the right or left central sulcus.
- Select the right or left occipital lobe of the cerebral cortex.

Quiz 21.b. Cranial Nerves

- Select the right or left optic nerve (II).
- Select the right or left olfactory nerve (I), bulb, or tract.
- Select the right or left oculomotor nerve (III).
- Select the right or left trochlear (IV) nerve.
- Select any part of the right or left trigeminal (V) nerve.
- Select the right or left semilunar (trigeminal) ganglion.
- Select the right or left abducens (VI) nerve.
- Select any part of the right or left facial (VII) nerve.
- Select the right or left vestibulocochlear (VIII) nerve.
- Select any part of the right or left glossopharyngeal (IX) nerve.
- Select any part of the right or left vagus (X) nerve.
- Select any part of the right or left accessory (XI) nerve.
- Select any part of the right or left hypoglossal (XII) nerve.

Quiz 23.b. Eye

- Select the sclera.
- Select the choroid.
- Select any part of the retina.
- Select the cornea.
- Select the lens.
- Select a lacrimal gland.
- Select the vitreous body.
- Select the optic disc.
- Select the iris.
- Select the lacrimal sac.

Quiz 23.c. Ear

- Select any part of the auricle.
- Select the external acoustic meatus.
- Select any part of the cochlea.
- Select any part of the malleus.
- Select any part of the incus.
- Select any part of the stapes.
- Select the oval window.
- Select the tympanic membrane.
- Select any part of a semicircular canal.

Quiz 23.d. Cochlea

- Select the scala vestibuli.
- Select the scala tympani.
- Select the cochlear duct.
- Select the vestibular membrane.
- Select the basilar membrane.
- Select the tectorial membrane.
- Select a hair cell.
- Select a supporting epithelial cell.
- Select a hair.

Quiz 23.e. Tongue

- Select the root of the tongue.
- Select the palatine tonsils.
- Select the lingual tonsils.
- Select the frenulum.
- Select the body of the tongue.
- Select the median sulcus.
- Select the apex of the tongue.

Quiz 23.f. Papillae

- Select the circumvallate (vallate) papillae.
- Select the filiform papillae.
- Select the fungiform papillae.
- Select any papillae that contain taste buds.
- Select the lingual tonsils.

Endocrine System

Quiz 26.b. Endocrine Organs and Functions

- Select the thyroid gland.
- Select any of the parathyroid glands.
- Select the right or left adrenal gland.
- Select any part of the pineal gland.
- Select any part of the anterior pituitary.
- Select any part of the posterior pituitary.
- Select the hypothalamus.
- Select any part of the pancreas.
- Select any part of the right or left kidney.
- Select any part of the right or left ovary.

Circulatory System

Quiz 29.b. Heart

- Select the left atrium.
- Select the right ventricle.
- Select the heart chamber that receives deoxygenated blood from veins.
- Select a papillary muscle.
- Select any of the chordae tendineae.
- Select any part of the right AV (tricuspid) valve.
- Select any part of the aortic valve.
- Select any part of the pulmonary valve.
- Select any part of the left AV (mitral or bicuspid) valve.
- Select the interventricular septum.
- Select any part of a semilunar valve.
- Select the sinoatrial (SA) node.
- Select the atrioventricular bundle (bundle of His).
- Select the atrioventricular (AV) node.
- Select a coronary artery.
- Select a coronary vein.

Quiz 30.b. Blood Vessels and Circulation

- Select a pulmonary vessel that carries deoxygenated blood.
- Select any part of the pulmonary trunk.
- Select the right or left common carotid artery.
- Select an artery of the circle of Willis.
- Select the right or left axillary artery.
- Select the right or left brachial artery.
- Select the right or left radial artery.

- Select the brachiocephalic trunk (innominate artery).
- Select the celiac trunk.
- Select the superior mesenteric artery.
- Select the inferior mesenteric artery.
- Select the right or left renal artery.
- Select the common hepatic artery.
- Select the right or left common iliac artery.
- Select the right or left femoral artery.
- Select the right or left external jugular vein.
- Select the right or left internal jugular vein.
- Select one of the venous sinuses.
- Select the right or left subclavian vein.
- Select the right or left basilic vein.
- Select the inferior vena cava.
- Select a vein of the azygos system.
- Select a vein of the hepatic portal system.
- Select the superior mesenteric vein.
- Select the inferior mesenteric vein.
- Select the right or left femoral vein.
- Select the right or left great saphenous vein.

Lymphatic System

Quiz 32.b. Lymphatic System

- Select the spleen.
- Select the thymus.
- Select the cisterna chyli.
- Select the thoracic duct (left lymphatic duct).
- Select a vessel or node that drains lymph into the right lymphatic duct.
- Select the left or right lumbar trunk.
- Select the right or left subclavian trunk.
- Select the right or left subclavian vein.
- Select the right or left internal jugular vein.

Respiratory System

Quiz 35.b. Upper Respiratory System

- Select the nasal cavity.
- Select any of the nasal conchae.
- Select any of the nasal cartilages.
- Select the nasopharynx.
- Select the oropharynx.
- Select the laryngopharynx.
- Select any part of the larynx.
- Select the epiglottis.
- Select the thyroid cartilage.
- Select the cricoid cartilage.
- Select the right or left arytenoid cartilage.
- Select the right or left corniculate cartilage.
- Select the right or left vocal ligament.
- Select the vocal folds.
- Select the vestibular folds.

Quiz 36.b. Lower Respiratory System

- Select the trachea.
- Select the tracheal cartilaginous rings.
- Select the right or left primary bronchus.
- Select the right or left secondary bronchi.
- Select any of the tertiary bronchi.
- Select any of the bronchioles.
- Select the right or left hilum.
- Select the middle lobe of the right lung.
- Select the horizontal fissure of the right lung.
- Select the oblique fissure of the left lung.
- Select the inferior lobe of the left lung.
- Select any of the pulmonary arteries.
- Select any of the pulmonary veins.
- Select the pulmonary trunk.

Quiz 37.b. Respiration

- Select the diaphragm.
- Select the right or left external intercostals.
- Select the right or left internal intercostals.
- Select any of the muscles that contract in forced inhalation.
- Select any of the muscles that contract in forced exhalation.
- Select the right or left common carotid artery.
- Select the aortic arch.
- Select any part of the right or left vagus nerve (CN X).
- Select any part of the medulla oblongata.
- Select any part of the right or left glossopharyngeal nerve (CN IX).

Digestive System

Quiz 39.b. Oral Cavity

- Select the tongue.
- Select the hard palate.
- Select a palatine tonsil.
- Select the uvula.
- Select a canine (cuspid).
- Select an incisor.
- Select the right or left parotid gland.

- Select the right or left submandibular duct.
- Select the right or left superficial or deep masseter.
- Select the epiglottis.
- Select the right or left sublingual gland.
- Select a premolar (bicuspid).
- Select the soft palate.
- Select the right or left temporalis.

Quiz 40.b. Esophagus and Stomach

- Select the esophagus.
- Select any part of the stomach.
- Select the cardiac sphincter.
- Select the longitudinal muscle layer of the stomach.
- Select the oblique muscle layer of the stomach.
- Select the circular muscle layer of the stomach.
- Select the pyloric sphincter.
- Select the right or left gastroepiploic artery.
- Select the right or left gastric artery.

Quiz 41.b. Accessory Organs of Digestion

- Select the gall bladder.
- Select any part of the pancreas.
- Select the caudate lobe of the liver.
- Select the falciform ligament.
- Select the common hepatic duct.
- Select the cystic duct.
- Select the main pancreatic duct (duct of Wirsung).
- Select the accessory pancreatic duct (duct of Santorini).
- Select the duodenum.
- Select one of the duodenal papillae.
- Select the common bile duct.

Quiz 42.b. Small and Large Intestines

- Select the duodenum.
- Select the jejunum.
- Select the ileum.
- Select any part of the taenia coli.
- Select the transverse colon.
- Select the sigmoid colon.
- Select the inferior mesenteric artery.
- Select the appendix.
- Select the cecum.
- Select the superior mesenteric artery.
- Select the rectum.
- Select the anal canal.
- Select the ascending colon.
- Select the descending colon.

Urinary System

Quiz 44.b. Kidney

- Select any part of the right or left kidney.
- Select the right or left renal artery.
- Select the right or left renal vein.
- Select any of the renal pyramids.
- Select the right or left ureter.
- Select the right or left renal pelvis.

Quiz 46.b. Urine Storage and Elimination

- Select any part of the right or left kidney.
- Select any of the renal pyramids.
- Select the right or left renal pelvis.
- Select the right or left ureter.
- Select any part of the bladder.
- Select the detrusor muscle.
- Select the trigone.
- Select the right or left urethral orifice.
- Select the internal urethral sphincter.
- Select the urethra.
- Select the external urethral sphincter.

Reproductive System

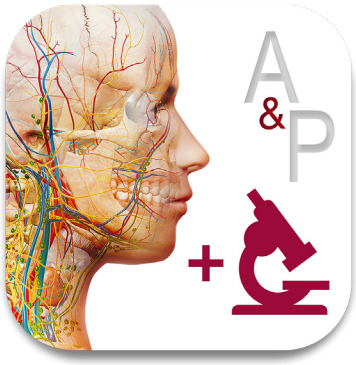
Quiz 48.b. Male Reproductive System

- Select any part of the right or left testicle.
- Select any part of the prostate.
- Select the right or left bulbourethral gland.
- Select any part of the vas deferens.
- Select the right or left spermatic cord.
- Select the right or left seminal vesicle.
- Select the right or left ejaculatory duct.
- Select the right or left epididymis.
- Select the glans penis.
- Select the right or left corpus cavernosum.
- Select the corpus spongiosum.
- Select any part of the prostatic urethra.
- Select any part of the membranous urethra.
- Select any part of the spongy urethra.

Quiz 49.b. Female Reproductive System

- Select any part of the uterus.
- Select any part of the right or left ovary.
- Select any part of the cervix.
- Select any part of the right or left uterine duct.
- Select the vagina.
- Select any part of the right or left mammary gland.
- Select the right or left lactiferous ducts.
- Select the right or left mammary gland lobules.
- Select the vestibule.
- Select the prepuce.
- Select the clitoris.
- Select the labia minora.
- Select the urethral orifice

Syllabus Correlations



Syllabus Correlation for *Essentials of Human Anatomy, 10th Edition*, by Elaine N. Marieb

Open Stax Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: The Human Body: An Orientation		
Chapter 2: Basic Chemistry		
Chapter 3: Cells and Tissues	Chapters 1-4: Cells & Tissue	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair, cellular respiration, transcription, and translation are featured in animations.
Chapter 4: Skin and Body Membranes	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 5: The Skeletal System	Chapters 7-12: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. 3D models include key bony landmarks of all the major bones. Animations show movement of all joint types. New histology slides of growth plate and cartilage.
Chapter 6: The Muscular System	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 7: The Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models of the brain and cranial nerves, spinal cord and spinal nerves. New histology slides of neurons, neuroglia, and the spinal cord. Animations and 3D models explore neuron structure and function, somatic and autonomic functions, somatic sensory signals, and skin sensory receptors.
Chapter 8: Special Senses	Chapters 17-23: Nervous System and Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, ears and hearing.
Chapter 9: The Endocrine System	Chapters 24-26: The Endocrine System	Animation on hormone actions. 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 10: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and functions of platelets. New histology slides of blood and types of white blood cells.
Chapter 11: The Cardiovascular System	Chapter 27: Introduction; Chapter 29: Heart; Chapter 30: Blood Vessels and Circulation	More than 70 assets detailing blood vessels in 3D. Includes animations on heart chambers, heart valves, and heart conduction as well as new histology slides of cardiac muscle tissue and blood vessel walls.
Chapter 12: The Lymphatic System and Body Defenses	Chapters 31-33: Lymphatic System	3D models of key organs as well as vessels and veins, lymph node function and distribution, and types of immunity. New spleen and lymph node histology slides.
Chapter 13: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 14: The Digestive System and Body Metabolism	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 15: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and reabsorption and secretion. Illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 16: The Reproductive System	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Models and illustrations cover ovulation, path of the zygote, and birth. Animations show lactation and fetal development. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.

Syllabus Correlation for *Human Anatomy & Physiology, 9th Edition*, by Elaine N. Marieb and Katja Hoehn

Marieb Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: The Human Body: An Orientation		
Chapter 2: Chemistry Comes Alive		
Chapter 3: Cells: The Living Units	Chapters 1-4: Cells & Tissue	Animations on cellular respiration, transcription, and translation.
Chapter 4: Tissue: The Living Fabric	Chapters 1-4: Cells & Tissue	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 5: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 6: Bones and Skeletal Tissue	Chapters 7-12: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. New histology slides of growth plate and cartilage.
Chapter 7: The Skeleton	Chapters 7-12: Skeletal System and Joints	Now with 3D models that include key bony landmarks of all of the major bones.
Chapter 8: Joints	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 9: Muscles and Muscle Tissue	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation.
Chapter 10: The Muscular System	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 11: The Fundamentals of the Nervous System and Nervous Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 12: The Central Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models of the brain, spinal cord, and spinal nerves showing anatomy and innervation. Includes new histology slides of spinal cord.
Chapter 13: The Peripheral Nervous System and Reflex Activity	Chapters 17-23: Nervous System and Special Senses	Includes animations and 3D models of somatic and autonomic functions, as well as somatic sensory signals and skin sensory receptors.
Chapter 14: The Autonomic Nervous System	Chapters 17-23: Nervous System and Special Senses	3D model conveying autonomic nervous functions.
Chapter 15: The Special Senses	Chapter 23: Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, and ears and hearing.
Chapter 16: The Endocrine System	Chapters 24-26: The Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 17: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 18: The Cardiovascular System: The Heart	Chapter 27: Introduction; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.
Chapter 19: The Cardiovascular System: Blood Vessels	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.
Chapter 20: The Lymphatic System and Lymphoid Organs and Tissues	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins and lymph node function and distribution. Includes new spleen and lymph node histology slides.
Chapter 21: The Immune System: Innate and Adaptive Body Defenses	Chapters 31-33: Lymphatic System	Phagocytosis animation and illustrations on innate immunity, adaptive immunity, and types of white blood cells. 3D models of B and T cells.

Chapter 22: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 23: The Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 24: Nutrition, Metabolism, and Body Temperature Regulation	Chapters 38-42: Digestive System; Chapters 24-26: The Endocrine System	3D models include the pancreas and pancreatic islets, and hypothalamus. Contains new pancreas histology slides.
Chapter 25: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 26: Fluid, Electrolyte, and Acid-Base Balance	Chapters 43-46: Urinary System	Animations include reabsorption and secretion.
Chapter 27: The Reproductive System	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 28: Pregnancy and Human Development	Chapters 47-50: Reproductive System	Models and illustrations cover ovulation, path of the zygote, and birth. Animations show lactation and fetal development.
Chapter 29: Heredity	Chapters 47-50: Reproductive System, Chapters 2-3: Cell Structure and Function and Cell Life Cycle	DNA illustrations, as well as transcription and translation animations and illustrations. Animation features an overview of the reproductive system.

Syllabus Correlation for *Fundamentals of Anatomy and Physiology, 9th Edition* by Elaine N. by Frederic H. Martini, Judi L. Nath, and Edwin F. Bartholomew

Martini Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: An Introduction to Anatomy and Physiology		
Chapter 2: The Chemical Level of Organization		
Chapter 3: The Cellular Level of Organization	Chapters 1-4: Cells & Tissue	Animations on cellular respiration, transcription, and translation.
Chapter 4: The Tissue Level of Organizaton	Chapters 1-4: Cells & Tissue	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 5: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 6: Osseous Tissue and Bone Structure	Chapters 7-9: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. New histology slides of growth plate and cartilage.
Chapter 7: The Axial Skeleton	Chapter 10: Axial Skeleton	3D models include key bony landmarks of all major bones.
Chapter 8: The Appendicular Skeleton	Chapter 11: Appendicular Skeleton	3D models include key bony landmarks of all major bones.
Chapter 9: Articulations	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 10: Muscle Tissue	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation.
Chapter 11: The Muscular System	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 12: Neural Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 13: The Spinal Cord, Spinal Nerves, and Spinal Reflexes	Chapters 17-23: Nervous System and Special Senses	3D models of the spinal cord and spinal nerves showing anatomy and innervation. Includes new histology slides of spinal cord.
Chapter 14: The Brain and Cranial Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the brain and cranial nerves showing anatomy and innervation.
Chapter 15: Neural Integration I: Sensory Pathways and the Somatic Nervous System	Chapters 17-23: Nervous System and Special Senses	Includes animations and 3D models of somatic and autonomic functions, as well as somatic sensory signals and skin sensory receptors.
Chapter 16: Neural Integration II: The Autonomic Nervous System and Higher-Order Functions	Chapters 17-23: Nervous System and Special Senses	3D models conveying autonomic nervous functions.
Chapter 17: The Special Senses	Chapter 23: Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, and ears and hearing.
Chapter 18: The Endocrine System	Chapters 24-26: The Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.

Chapter 19: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 20: The Heart	Chapter 27: Introduction; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.
Chapter 21: Blood Vessels and Circulation	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.
Chapter 22: The Lymphatic System and Immunity	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins and lymph node function and distribution. Includes new spleen and lymph node histology slides.
Chapter 23: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 24: The Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 25: Metabolism and Energetics	Chapters 38-42: Digestive System; Chapters 24-26: Endocrine System	3D models include the pancreas and pancreatic islets, and hypothalamus. Contains new pancreas histology slides.
Chapter 26: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 27: Fluid, Electrolyte, and Acid-Base Balance	Chapters 43-46: Urinary System	Animations include reabsorption and secretion.
Chapter 28: The Reproductive System	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 29: Development and Inheritance	Chapters 47-50: Reproductive System, Chapters 2-3: Cell Structure and Function and Cell Life Cycle	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

Syllabus Correlation for *Anatomy & Physiology: An Integrative Approach*
by Michael P. McKinley, Valerie Dean O'Loughlin, Theresa Stouter Bidle

McKinley Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: The Sciences of Anatomy and Physiology		
Chapter 2: Atoms, Ions, and Molecules		
Chapter 3: Energy, Chemical Reactions, and Cellular Respiration	Chapters 1-4: Cells & Tissue	Animation on cellular respiration.
Chapter 4: Biology of the Cell	Chapters 1-4: Cells & Tissue	In-depth animations and illustrations of transcription and translation.
Chapter 5: Tissue Organizaton	Chapters 1-4: Cells & Tissue	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 6: Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 7: Skeletal System: Bone Structure and Function	Chapters 7-9: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. New histology slides of growth plate and cartilage.
Chapter 8: Skeletal System: Axial and Appendicular Skeleton	Chapter 10: Axial Skeleton; Chapter 11: Appendicular Skeleton	3D models include key bony landmarks of all major bones.
Chapter 9: Skeletal System: Articulations	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 10: Muscle Tissue	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation.
Chapter 11: Muscular System: Axial and Appendicular Muscles	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 12: Nervous System: Nervous Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 13: Nervous System: Brain and Cranial Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the brain and cranial nerves showing anatomy and innervation.
Chapter 14: Nervous System: Spinal Cord and Spinal Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the spinal cord and spinal nerves showing anatomy and innervation. Includes new histology slides of spinal cord.
Chapter 15: Nervous System: Autonomic Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models conveying autonomic nervous functions.
Chapter 16: Nervous System: Senses	Chapter 23: Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, and ears and hearing.
Chapter 17: Endocrine System	Chapters 24-26: The Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 18: Cardiovascular System: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 19: Cardiovascular System: Heart	Chapter 27: Introduction; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.

Chapter 20: Cardiovascular System: Vessels and Circulation	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.
Chapter 21: Lymphatic System	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins and lymph node function and distribution. Includes new spleen and lymph node histology slides.
Chapter 22: Immune System and the Body's Defense	Chapters 31-33: Lymphatic System	Phagocytosis animation and illustrations on innate immunity, adaptive immunity, and types of white blood cells. 3D models of B and T cells.
Chapter 23: Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 24: Urinary System	Chapters 43-46: Urinary System	Animations include filtration and illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 25: Fluid and Electrolytes	Chapters 43-46: Urinary System	Animations include reabsorption and secretion.
Chapter 26: Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 27: Nutrition and Metabolism	Chapters 38-42: Digestive System; Chapters 24-26: Endocrine System	3D models include the pancreas and pancreatic islets, and hypothalamus. Contains new pancreas histology slides.
Chapter 28: Reproductive System	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 29: Development, Pregnancy, and Heredity	Chapters 47-50: Reproductive System, Chapters 2-3: Cell Structure and Function and Cell Life Cycle	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

Syllabus Correlation for *Anatomy & Physiology: The Unity of Form and Function, 6th Edition* by Kenneth S. Saladin

Saladin Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: Major Themes of Anatomy and Physiology; Atlas A: General Orientation to Human Anatomy		
Chapter 2: The Chemistry of Life		
Chapter 3: Cellular Form and Function	Chapters 1-4: Cells & Tissue	Animation on cellular respiration.
Chapter 4: Genetics and Cellular Function	Chapters 1-4: Cells & Tissue	In-depth animations and illustrations of transcription and translation.
Chapter 5: Histology	Chapters 1-4: Cells & Tissue	3D models showing anatomy of all major parts of the cell.
Chapter 6: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 7: Bone Tissue	Chapters 7-9: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. New histology slides of growth plate and cartilage.
Chapter 8: The Skeletal System	Chapters 7-9: Skeletal System and Joints	3D models include key bony landmarks of all major bones.
Chapter 9: Joints	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 10: The Muscular System; Atlas B: Regional and Surface Anatomy	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 11: Muscular Tissue	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation.
Chapter 12: Nervous Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 13: The Spinal Cord, Spinal Nerves, and Somatic Reflexes	Chapters 17-23: Nervous System and Special Senses	3D models of the spinal cord and spinal nerves, as well as animations and 3D models of somatic and autonomic functions, somatic sensory signals, and skin sensory receptors. Includes new histology slides of spinal cord.
Chapter 14: The Brain and Cranial Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the brain and cranial nerves showing anatomy and innervation.
Chapter 15: The Autonomic Nervous System and Visceral Reflexes	Chapters 17-23: Nervous System and Special Senses	3D models conveying autonomic nervous functions.
Chapter 16: Sense Organs	Chapter 23: Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, taste and eyes and vision, and ears and hearing.
Chapter 17: The Endocrine System	Chapters 24-26: The Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 18: The Circulatory System: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 19: The Circulatory System: The Heart	Chapter 27: Introduction; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.
Chapter 20: The Circulatory System: Blood Vessels and Circulation	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.

Chapter 21: The Lymphatic and Immune Systems	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins, lymph node function and distribution, and types of immunity. Includes new spleen and lymph node histology slides.
Chapter 22: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 23: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 24: Water, Electrolyte, and Acid-Base Balance	Chapters 43-46: Urinary System	Animations include reabsorption and secretion.
Chapter 25: The Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 26: Nutrition and Metabolism	Chapters 38-42: Digestive System; Chapters 24-26: Endocrine System	3D models include the pancreas and pancreatic islets, and hypothalamus. Contains new pancreas histology slides.
Chapter 27: The Male Reproductive System	Chapters 47-50: Reproductive System	3D models of male reproductive anatomy, including animation on spermatogenesis. Includes new histology slides of the testes.
Chapter 28: The Female Reproductive System	Chapters 47-50: Reproductive System	3D models of female reproductive anatomy, including animation on oogenesis. Includes new histology slides of the ovaries, uterus, and mammary glands.
Chapter 29: Human Development and Aging	Chapters 47-50: Reproductive System	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

Syllabus Correlation for *Principles of Anatomy and Physiology, 13th Edition* by Gerard J. Tortora and Bryan Derrickson

Tortora Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: An Introduction to the Human Body		
Chapter 2: The Chemical Level of Organization		
Chapter 3: The Cellular Level of Organization	Chapters 1-4: Cells & Tissue	Animations on cellular respiration, transcription, and translation.
Chapter 4: The Tissue Level of Organizaton	Chapters 1-4: Cells & Tissue	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 5: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 6: The Skeletal System: Bone Tissue	Chapters 7-9: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. New histology slides of growth plate and cartilage.
Chapter 7: The Skeletal System: The Axial Skeleton	Chapter 10: Axial Skeleton	3D models include key bony landmarks of all major bones.
Chapter 8: The Skeletal System: The Appendicular Skeleton	Chapter 11: Appendicular Skeleton	3D models include key bony landmarks of all major bones.
Chapter 9: Joints	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 10: Muscular Tissue	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation.
Chapter 11: The Muscular System	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 12: Nervous Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 13: The Spinal Cord and Spinal Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the spinal cord and spinal nerves showing anatomy and innervation. Includes new histology slides of spinal cord.
Chapter 14: The Brain and Cranial Nerves	Chapters 17-23: Nervous System and Special Senses	3D models of the brain and cranial nerves showing anatomy and innervation.
Chapter 15: The Autonomic Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models conveying autonomic nervous functions.
Chapter 16: Sensory, Motor, and Integrative Systems	Chapters 17-23: Nervous System and Special Senses	3D models of somatic and autonomic functions, somatic sensory signals, and skin sensory receptors.
Chapter 17: The Special Senses	Chapter 23: Special Senses	3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, and ears and hearing.
Chapter 18: The Endocrine System	Chapters 24-26: Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 19: The Cardiovascular System: The Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.

Chapter 20: The Cardiovascular System: The Heart	Chapter 27: Introduction; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.
Chapter 21: The Cardiovascular System: Blood Vessels and Hemodynamics	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.
Chapter 22: The Lymphatic System and Immunity	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins, lymph node function and distribution, and types of immunity. Includes new spleen and lymph node histology slides.
Chapter 23: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 24: The Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 25: Metabolism and Nutrition	Chapters 38-42: Digestive System; Chapters 24-26: Endocrine System	3D models include the pancreas and pancreatic islets, and hypothalamus. Contains new pancreas histology slides.
Chapter 26: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 27: Fluid, Electrolyte, and Acid-Base Homeostasis	Chapters 43-46: Urinary System	Animations include reabsorption and secretion.
Chapter 28: The Reproductive Systems	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 29: Development and Inheritance	Chapters 47-50: Reproductive System	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

Syllabus Correlation for Anatomy and Physiology, *from Open Stax*

Open Stax Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: An Introduction to the Human Body		
Chapter 2: The Chemical Level of Organization		
Chapter 3: The Cellular Level of Organization	Chapter 1: Introduction: Cells and Tissues; Chapter 2: Cell Structure and Function; Chapter 3: Cell Life Cycle	Animations on cellular respiration, transcription, and translation.
Chapter 4: The Tissue Level of Organization	Chapter 4: Tissues	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 5: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 6: Bone Tissue and the Skeletal System	Chapter 7: Introduction: Skeletal System/ Joints; Chapter 8: Types of Bones; Chapter 9: Bone Tissue	Animations on formation of flat bones, long bones, and bone repair. 3D models include key bony landmarks of all the major bones. New histology slides of growth plate and cartilage.
Chapter 7: Axial Skeleton	Chapter 10: Axial Skeleton	3D models include key bony landmarks of all the major bones.
Chapter 8: The Appendicular Skeleton	Chapter 11: Appendicular Skeleton	3D models include key bony landmarks of all the major bones.
Chapter 9: Joints	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 10: Muscle Tissue	Chapter 13: Introduction: Muscular System; Chapter 14: Skeletal Muscle Tissue; Chapter 15: Smooth and Cardiac Muscle Tissue	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 11: The Muscular System	Chapter 16: Muscular System	More than 50 3D models of muscle groups.
Chapter 12: The Nervous System and Nervous Tissue	Chapter 17: Introduction: Nervous System/ Special Senses; Chapter 18: Nervous Tissue	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 13: Anatomy of the Nervous System	Chapter 19: Spinal Cord and Spinal Nerves; Chapter 20: Brain; Chapter 21: Cranial Nerves	3D models of the spinal cord and spinal nerves showing anatomy and innervation. Includes new histology slides of spinal cord.
Chapter 14: The Somatic Nervous System	Chapter 22: Somatic and Autonomic Nervous Systems; Chapter 23: Special Senses	3D models of somatic and autonomic functions, somatic sensory signals, and skin sensory receptors; as well as 3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, and ears and hearing.
Chapter 15: The Autonomic Nervous System	Chapter 22: Somatic and Autonomic Nervous Systems	3D models conveying autonomic nervous functions.
Chapter 16: The Neurological Exam		
Chapter 17: The Endocrine System	Chapters 24-26: Endocrine System	Animation on hormone actions, as well as 3D models and explanation of major organs and functions. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 18: The Cardiovascular System: Blood	Chapter 27: Introduction: Circulatory System; Chapter 28: Blood	Animations, 3D models, and illustrations explain the production and functions of blood plasma, red blood cells, white blood cells, and platelets. Includes new histology slides of blood and types of white blood cells.

Chapter 19: The Cardiovascular System: The Heart	Chapter 27: Introduction: Circulatory System; Chapter 29: Heart	Animations on heart chambers, heart valves, and heart conduction. Contains new histology slides of cardiac muscle tissue.
Chapter 20: The Cardiovascular System: Blood Vessels and Circulation	Chapter 27: Introduction: Circulatory System; Chapter 30: Blood Vessels and Circulation	More than 55 assets detailing arteries and veins in 3D. Includes new histology slides of blood vessel walls.
Chapter 21: The Lymphatic and Immune System	Chapters 31-33: Lymphatic System	3D models of key organs, as well as vessels and veins, lymph node function and distribution, and types of immunity. Includes new spleen and lymph node histology slides.
Chapter 22: The Respiratory System	Chapters 34-37: Respiratory System	3D models of all major respiratory structures. Animations include physiology of nasal mucosa, sneezing, function of the epiglottis, phonation, and function of the trachea and bronchi. New histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 23: The Digestive System	Chapters 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 24: Metabolism and Nutrition		
Chapter 25: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and reabsorption and secretion. Illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 26: Fluid, Electrolyte, and Acid-Base Balance		
Chapter 27: The Reproductive System	Chapter 47: Introduction: Reproductive System; Chapter 48: Male Reproductive System; Chapter 49: Female Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 28: Development and Inheritance	Chapter 50: Sexual Reproduction and Development	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

Syllabus Correlation for *Seeley's Anatomy & Physiology, 11th Edition*
by Cinnamon VanPutte, Jennifer Regan, and Andrew Russ

Seeley's Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: The Human Organism		
Chapter 2: The Chemical Basis of Life		
Chapter 3: Cell Biology	Chapters 1-4: Cells & Tissue	Animations show passive and active transport, mitosis, cellular respiration, transcription, and translation. 3D models and illustrations explain cell structures and functions, cell types, osmosis, the cell cycle, meiosis, protein synthesis, and DNA replication.
Chapter 4: Tissues	Chapter 4: Tissues	An animation and 3D model show tissue repair and scarring. 3D models explain epithelial, connective, muscular, and nervous tissue. New histology slides examine different types of epithelial and connective tissue.
Chapter 5: Integumentary System	Chapters 5–6: Integumentary System	An animation and 3D model show tissue repair and scarring. 3D models explain the epidermis and dermis layers, skin circulation and innervation, and the structure and function of skin, hair, nails, and glands. Includes new histology slides of epidermis, dermis, and mammary glands.
Chapter 6: Skeletal System: Bones and Bone Tissue	Chapter 8: Types of Bones; Chapter 9: Bone Tissue	Animations on formation of flat bones, long bones, and bone repair. 3D models and illustrations explain the bone types, bone tissue, and types of fractures. New histology slides of growth plate and cartilage.
Chapter 7: Skeletal System: Gross Anatomy	Chapter 10: Axial Skeleton; Chapter 11: Appendicular Skeleton	3D models and illustrations explain the structures of the axial and appendicular skeleton with key bony landmarks on all the major bones.
Chapter 8: Joints and Movement	Chapter 12: Joints	Animations and 3D models show all the joint types and their movements. An illustration explains the effects of aging on joints.
Chapter 9: Muscular System: Histology and Physiology	Chapters 13–16: Muscle Tissue and Muscular System	7 different animations, as well as several 3D models, illustrations, and new histology slides, cover the structure and functions of skeletal, smooth, and cardiac muscle.
Chapter 10: Muscular System: Gross Anatomy	Chapter 16: Muscular System	3D models explore over 50 different groups of muscle structures. An animation shows muscle interactions. Illustrations explain skeletal muscle attachments and the three classes of levers.
Chapter 11: Functional Organization of Nervous Tissue	Chapter 17: Introduction; Chapter 18: Nervous Tissue; Chapter 22: Somatic and Autonomic Nervous Systems	3D models, animations, and illustrations explain the functions of the central, peripheral, somatic, autonomic, sympathetic, and parasympathetic divisions of the nervous system; neuron types, structure, and function; neuroglia in the central and peripheral nervous systems; resting and action potentials; and neurotransmitters. New histology slides explore neurons and neuroglia.
Chapter 12: Spinal Cord and Spinal Nerves	Chapter 19: Spinal Cord and Spinal Nerves	3D models and illustrations explain spinal cord anatomy, sensory signals, motor commands, and spinal nerve structure and regions. An animation and 3D model cover the somatic reflex arc. Includes new histology slides of the spinal cord.
Chapter 13: Brain and Cranial Nerves	Chapter 20: Brain; Chapter 21: Cranial Nerves	3D models show the brain's structures, functions, and blood supply as well as the cranial nerves. Animations explain olfaction and vision.
Chapter 14: Integration of Nervous System Functions	Chapter 22: Somatic and Autonomic Nervous Systems	3D models explain somatic nervous system functions, somatic sensory and motor signals, and skin sensory receptors. An illustration shows somatic sensory and motor pathways. An animation and 3D model explain skeletal muscle contraction and the role of the basal ganglia and cerebellum.
Chapter 15: The Special Senses	Chapter 23: Special Senses	3D models explain the olfactory, taste, vision, auditory, and equilibrium pathways. Animations show the processes of olfaction, vision, and hearing. 3D models and illustrations identify the structures of the tongue, eyes, and ears.

Chapter 16: Autonomic Nervous System	Chapter 22: Somatic and Autonomic Nervous Systems	An animation and 3D model compare somatic and autonomic nervous system functions. 3D models and illustrations explain the structures and functions of the autonomic nervous system and its sympathetic and parasympathetic divisions.
Chapter 17: Functional Organization of the Endocrine System	Chapters 24–26: Endocrine System	Animations show the endocrine system's structures and functions and hormone action. A 3D model explains hormone circulation.
Chapter 18: Endocrine Glands	Chapters 24–26: Endocrine System	3D models show the primary and secondary endocrine organs and explain the hormones they produce. New histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 19: Cardiovascular System: Blood	Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 20: Cardiovascular System: The Heart	Chapter 29: Heart	Animations show the anatomy and conduction of the heart, electrocardiogram, cardiac cycle, cardiac output, and blood pressure. 3D models explain the heart's location, anatomy, functions, circulation, conduction, and autonomic regulation. New histology slides show cardiac muscle tissue.
Chapter 21: Cardiovascular System: Blood Vessels and Circulation	Chapter 27: Introduction; Chapter 30: Blood Vessels and Circulation	Animations explain circulatory system functions, blood pressure, and systolic and diastolic pressure. 3D models and illustrations show the blood vessel types and their structure, pulmonary circulation, and systemic circulation, including over 40 models of specific blood vessel groups. Includes new histology slides of blood vessel walls.
Chapter 22: Lymphatic System and Immunity	Chapters 31–33: Lymphatic System	3D models explain the structure and functions of the key lymphatic organs, vessels and veins, and lymph nodes. 3D models and illustrations explore innate immunity, adaptive immunity, and types of white blood cells. An animation shows phagocytosis. Includes new spleen and lymph node histology slides.
Chapter 23: Respiratory System	Chapter 34–37: Respiratory System	3D models explain all the major respiratory structures. Animations show the nasal mucosa's physiology; the functions of the epiglottis, trachea, and bronchi; and respiratory processes, including sneezing, olfaction, and phonation. Animations and 3D models explain pulmonary ventilation, external respiration, internal respiration, and respiratory regulation. Includes new histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 24: Digestive System	Chapters 38–42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 25: Nutrition, Metabolism, and Temperature Regulation	Chapters 38–42: Digestive System; Chapters 24–26: Endocrine System	3D models explain the pancreas, pancreatic islets, liver, and the hypothalamus. Includes new pancreas histology slides. An illustration explains blood glucose level. An animation and 3D models show absorption in the intestines.
Chapter 26: Urinary System	Chapters 43–46: Urinary System	Animations and 3D models show filtration, reabsorption, and secretion. 3D models and illustrations explain the kidneys, nephron structure, urine composition, the ureters, the micturition reflex, and the male and female bladder and urethra. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 27: Water, Electrolyte, and Acid-Base Balance	Chapters 43–46: Urinary System	Animations and 3D models show reabsorption and secretion.
Chapter 28: Reproductive System	Chapters 47–50: Reproductive System; Chapter 3: Cell Life Cycle	3D models and illustrations explain the male and female reproductive structures and hormones, meiosis, and the reproductive lifespan. Animations show spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 29: Development, Growth, Aging, and Genetics	Chapters 47–50: Reproductive System, Chapters 2–3: Cell Structure and Function and Cell Life Cycle	Animations, 3D models, and illustrations explain ovulation, sexual reproduction, fertilization, pregnancy hormones, development stages (gamete, zygote, embryo, fetus), birth, and lactation as well as meiosis and DNA replication, transcription, and translation.

Syllabus Correlation for *Hole's Human Anatomy & Physiology, 14th Edition*
by David Shier, Jackie Butler, and Ricki Lewis

Hole's Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: Introduction to Human Anatomy and Physiology		
Chapter 2: Chemical Basis of Life		
Chapter 3: Cells	Chapters 1-4: Cells & Tissue	Animations show passive and active transport and mitosis. 3D models and illustrations explain cell structures and functions, cell types, osmosis, the cell cycle, and meiosis.
Chapter 4: Cellular Metabolism	Chapters 1-4: Cells & Tissue	Animations show cellular respiration, transcription, and translation. 3D models and illustrations explain protein synthesis and DNA replication.
Chapter 5: Tissues	Chapter 4: Tissues	An animation and 3D model show tissue repair and scarring. 3D models explain epithelial, connective, muscular, and nervous tissue. New histology slides examine different types of epithelial and connective tissue.
Chapter 6: Integumentary System	Chapters 5–6: Integumentary System	An animation and 3D model show tissue repair and scarring. 3D models explain the epidermis and dermis layers, skin circulation and innervation, and the structure and function of skin, hair, nails, and glands. Includes new histology slides of epidermis, dermis, and mammary glands.
Chapter 7: Skeletal System	Chapters 7–12: Skeletal System and Joints	Animations on formation of flat bones, long bones, bone repair and osteoporosis. 3D models and illustrations explain the bone types, bone tissue, types of fractures, and the structures of the axial and appendicular skeleton with key bony landmarks on all the major bones. New histology slides of growth plate and cartilage.
Chapter 8: Joints of the Skeletal System	Chapter 12: Joints	Animations and 3D models show all the joint types and their movements.
Chapter 9: Muscular System	Chapters 13–16: Muscle Tissue and Muscular System	7 different animations, as well as several 3D models, illustrations, and new histology slides, cover the structure and functions of skeletal, smooth, and cardiac muscle.
Chapter 10: Nervous System I: Basic Structure and Function	Chapters 17–23: Nervous System and Special Senses	Illustrations explain types of neurons and neuron structure. An animation shows neuron function.
Chapter 11: Nervous System II: Divisions of the Nervous System	Chapters 17–23: Nervous System and Special Senses	3D models and illustrations show the anatomy and functions of the brain, cranial nerves, spinal cord, and spinal nerves. Includes new histology slides of the spinal cord. 3D models, animations, and illustrations explain the functions of the somatic, autonomic, sympathetic, and parasympathetic nervous systems.
Chapter 12: Nervous System III: Senses	Chapter 23: Special Senses	3D models explain the olfactory, taste, vision, auditory, and equilibrium pathways. Animations show the processes of olfaction, vision, and hearing. 3D models and illustrations identify the structures of the tongue, eyes, and ears.
Chapter 13: Endocrine System	Chapters 24–26: Endocrine System	An animation shows hormone actions. 3D models and illustrations explain the major endocrine organs and functions. Includes histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 14: Blood	Chapter 27: Introduction; Chapter 28: Blood	Animations, 3D models, and illustrations explain the production and functions of blood plasma, red blood cells, white blood cells, and platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 15: Cardiovascular System	Chapter 27: Introduction; Chapter 29: Heart; Chapter 30: Blood Vessels and Circulation	Animations show the anatomy and conduction of the heart, electrocardiogram, cardiac cycle, cardiac output, and blood pressure. 3D models explain the heart's location, anatomy, functions, circulation, conduction, and autonomic regulation, as well as blood vessel types and structure and pulmonary and systemic circulation. New histology slides include cardiac muscle tissue and blood vessel walls.

Chapter 16: Lymphatic System and Immunity	Chapters 31–33: Lymphatic System	3D models explain the structure and functions of the key lymphatic organs, vessels and veins, and lymph nodes. 3D models and illustrations explore innate immunity, adaptive immunity, and types of white blood cells. An animation shows phagocytosis. Includes new spleen and lymph node histology slides.
Chapter 17: Digestive System	Chapters 38–42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 18: Nutrition and Metabolism	Chapters 38–42: Digestive System; Chapters 24–26: Endocrine System	3D models explain the pancreas, pancreatic islets, liver, and the hypothalamus. Includes new pancreas histology slides. An illustration explains blood glucose level. An animation and 3D models show absorption in the intestines.
Chapter 19: Respiratory System	Chapter 34–37: Respiratory System	3D models explain all the major respiratory structures. Animations show the nasal mucosa's physiology; the functions of the epiglottis, trachea, and bronchi; and respiratory processes, including sneezing, olfaction, and phonation. Animations and 3D models explain pulmonary ventilation, external respiration, internal respiration, and respiratory regulation. Includes new histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 20: Urinary System	Chapters 43–46: Urinary System	Animations and 3D models show filtration, reabsorption, and secretion. 3D models and illustrations explain the kidneys, nephron structure, urine composition, the ureters, the micturition reflex, and the male and female bladder and urethra. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 21: Water, Electrolyte, and Acid-Base Balance	Chapters 43–46: Urinary System	Animations and 3D models show reabsorption and secretion.
Chapter 22: Reproductive Systems	Chapters 47–50: Reproductive System	3D models and illustrations explain the male and female reproductive structures and hormones, meiosis, and the reproductive lifespan. Animations show spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 23: Pregnancy, Growth, and Development	Chapters 47–50: Reproductive System	3D models and illustrations explain ovulation, sexual reproduction, pregnancy hormones, development stages (gamete, zygote, embryo, fetus), and birth. Animations show lactation, fertilization, and fetal development.
Chapter 24: Genetics and Genomics	Chapters 47–50: Reproductive System, Chapters 2–3: Cell Structure and Function and Cell Life Cycle	Illustrations explain fetal reproductive development and the reproductive lifespan. Animations, 3D models, and illustrations explain DNA replication, transcription, and translation as well as meiosis.

Syllabus Correlation for *Human Anatomy & Physiology, 2nd Edition*
by Erin C. Amerman

Amerman's Chapter Name	Visible Body's Anatomy & Physiology Unit	Key Highlights
Chapter 1: Introduction to Anatomy and Physiology		
Chapter 2: The Chemistry of Life		
Chapter 3: The Cell	Chapters 1-4: Cells & Tissue	Animations show passive and active transport, mitosis, cellular respiration, transcription, and translation. 3D models and illustrations explain cell structures and functions, cell types, osmosis, the cell cycle, meiosis, protein synthesis, and DNA replication.
Chapter 4: Histology	Chapter 4: Tissues	3D models explore epithelial, connective, and muscle tissue. New histology slides examine different types of epithelial and connective tissue. Tissue repair and scarring are featured in an animation and 3D model.
Chapter 5: The Integumentary System	Chapters 5-6: Integumentary System	Stunning animation on tissue repair. 3D models and new histology slides of epidermis and dermis layers. Includes histology slides of mammary glands.
Chapter 6: Bones and Bone Tissue	Chapters 7-12: Skeletal System and Joints	Animations on formation of flat bones, long bones, and bone repair. 3D models include key bony landmarks of all the major bones. New histology slides of growth plate and cartilage.
Chapter 7: The Skeletal System	Chapters 7-12: Skeletal System and Joints	3D models include key bony landmarks of all the major bones.
Chapter 8: Articulations	Chapter 12: Joints	Animations showing movement of all joint types.
Chapter 9: The Muscular System	Chapters 13-16: Muscle Tissue and Muscular System	More than 50 3D models of muscle groups.
Chapter 10: Muscle Tissue and Physiology	Chapters 13-16: Muscle Tissue and Muscular System	Animations on skeletal muscle contraction, featuring action potentials and cross-bridge formation. Includes new histology slides of skeletal, smooth, and cardiac muscle tissue.
Chapter 11: Introduction to the Nervous System and Nervous Tissue	Chapters 17-23: Nervous System and Special Senses	Illustrations of types of neurons and neuron structure. Includes animation of neuron function and new histology slides of neurons and neuroglia.
Chapter 12: The Central Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models show the brain's structures, functions, and blood supply.
Chapter 13: The Peripheral Nervous System	Chapters 17-23: Nervous System and Special Senses	3D models and illustrations show the anatomy and functions of the cranial nerves, spinal cord, and spinal nerves. Includes new histology slides of the spinal cord.
Chapter 14: The Autonomic Nervous System and Homeostasis	Chapters 17-23: Nervous System and Special Senses	3D models, animations, and illustrations explain the functions of the somatic, autonomic, sympathetic, and parasympathetic nervous systems.
Chapter 15: The Special Senses	Chapter 23: Special Senses	3D models explain the olfactory, taste, vision, auditory, and equilibrium pathways. Animations show the processes of olfaction, vision, and hearing. 3D models and illustrations identify the structures of the tongue, eyes, and ears.
Chapter 16: The Endocrine System	Chapters 24-26: The Endocrine System	An animation shows hormone actions. 3D models and illustrations explain the major endocrine organs and functions. Includes histology slides of the pituitary gland, adrenal gland, and pancreas.
Chapter 17: The Cardiovascular System I: The Heart	Chapter 29: Heart	Animations show the anatomy and conduction of the heart, electrocardiogram, cardiac cycle, cardiac output, and blood pressure. 3D models explain the heart's location, anatomy, functions, circulation, conduction, and autonomic regulation. New histology slides show cardiac muscle tissue.
Chapter 18: The Cardiovascular System II: The Blood Vessels	Chapter 27: Introduction: Circulatory System; Chapter 30: Blood Vessels and Circulation	Animations explain circulatory system functions, blood pressure, and systolic and diastolic pressure. 3D models and illustrations show the blood vessel types and their structure, pulmonary circulation, and systemic circulation, including over 40 models of specific blood vessel groups. Includes new histology slides of blood vessel walls.

Chapter 19: Blood	Chapter 28: Blood	Animations on blood plasma, production of red blood cells, function of red blood cells, and function of platelets. Includes new histology slides of blood and types of white blood cells.
Chapter 20: The Lymphatic System and Immunity	Chapters 31-33: The Lymphatic System	3D models explain the structure and functions of the key lymphatic organs, vessels and veins, and lymph nodes. 3D models and illustrations explore innate immunity, adaptive immunity, and types of white blood cells. An animation shows phagocytosis. Includes new spleen and lymph node histology slides.
Chapter 21: The Respiratory System	Chapters 34-37: Respiratory System	3D models explain all the major respiratory structures. Animations show the nasal mucosa's physiology; the functions of the epiglottis, trachea, and bronchi; and respiratory processes, including sneezing, olfaction, and phonation. Animations and 3D models explain pulmonary ventilation, external respiration, internal respiration, and respiratory regulation. Includes new histology slides of the trachea wall, lung tissue, bronchial trees, and alveoli.
Chapter 22: The Digestive System	Chapter 38-42: Digestive System	Animations include chewing and swallowing, peristalsis, and absorption. 3D models dive deep into primary and accessory organs of digestion. Includes new histology slides of taste buds, salivary glands, esophagus, stomach, pancreas, small intestine, and large intestine.
Chapter 23: Metabolism and Nutrition		
Chapter 24: The Urinary System	Chapters 43-46: Urinary System	Animations include filtration and reabsorption and secretion. Illustrations show filtration membrane and urine composition. 3D models explore kidneys, ureters, bladder, urethra, and micturition reflex. New histology slides of the kidneys, nephrons, ureters, and bladder.
Chapter 25: Fluid, Electrolyte, and Acid-Base Homeostasis		
Chapter 26: The Reproductive System	Chapters 47-50: Reproductive System	Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis. Includes new histology slides of the testes, ovaries, uterus, and mammary glands.
Chapter 27: Development and Heredity	Chapter 50: Sexual Reproduction and Development	Models and illustrations cover ovulation, path of the zygote, birth, transcription, and translation. Animations show lactation and fetal development.

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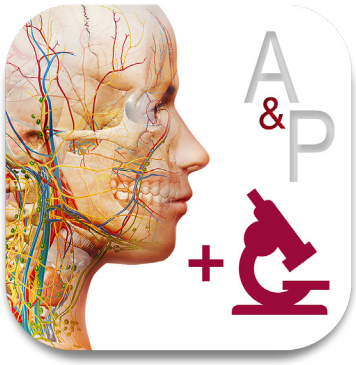

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