Welcome

Thank you for your adoption of Anatomy & Physiology by Visible Body. This software provides a new approach that helps your students learn the intricacies of anatomy and physiology. The goal of this manual is to provide you with content that supports using the product, whether in class, in the lab, or for homework.

The team at Visible Body is dedicated to helping students and professors get the most out of Anatomy & Physiology. If while using this manual you have any questions or suggestions, please reach out to us. We look forward to working with you.

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Contents

1 Learning objectives (page 4)
   ▶ A complete list of each unit’s learning objectives

2 Multiple choice quizzes and answers (page 12)
   ▶ A list of all multiple-choice questions and answers

3 Dissection quizzes (page 39)
   ▶ A listing of each anatomical structure students are asked to identify

4 Syllabus correlations (page 46)
   ▶ Tables that link chapters in the most popular textbooks with Anatomy & Physiology’s content, featuring:
     • Marieb, 9th edition
     • Martini, 9th edition
     • McKinley
     • Saladin, 6th edition
     • Tortora, 13th edition

Additional resources
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Learning Objectives for Anatomy & Physiology
Anatomy & Physiology by Visible Body contains 12 units. Below is a listing of each unit, the chapters within it, and the unit's 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 organelles of a typical cell and describe their functions.
   - Describe the structure and functions of the plasma membrane.
   - Explain how substances cross the plasma membrane.
   - Describe the process of osmosis.
   - 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.
   - Describe the cross-sectional structure of a vertebra.
   - Locate and identify the bones, major landmarks, and ligaments of the vertebral column.
   - Locate and identify the bones of the thoracic cage.
Locate and identify the structures that make up the appendicular skeleton.

3. Skeletal System and Joints (continued)

- 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.
- Describe the structure and function of the arches of the foot.
- Locate and identify the bones and major landmarks of the lower limb.
- 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.
- Describe the location and function of smooth muscle.
- Locate and identify smooth muscle layers of the stomach.
- Describe the location and function of cardiac muscle.
- Describe the roles of agonists and antagonists in muscle movement. 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.
- 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 or processes:
  - 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 function.
- 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 released by the posterior lobe of the pituitary gland and describe their functions.
- Locate and identify target organs of pituitary hormones.
- 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 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. 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
  - Circle of Willis
  - Upper limb
  - Thorax
  - Azygos system
  - Hepatic portal system
  - Abdomen
  - Intestines
  - Pelvis
  - Leg and foot
- Locate and identify branches of the abdominal aorta.
- Locate and identify the venous sinuses.

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 the major components of the respiratory system and describe their functions.
- 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 of the nose and nasal cavity.
- Locate and identify structures that make up the upper respiratory system.
- 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.
- 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.
9. Respiratory System (continued)

- 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 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, gallbladder, 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, gallbladder, 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.
- Describe the function of circular folds and villi in 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.
- Describe the process of glomerular filtration.
- Locate and identify structures involved in 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 structures involved in maintaining urinary continence.
- 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 development of reproductive anatomy in utero.
- Explain how the reproductive system changes over the course of life.
- 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 stages of fetal development during pregnancy.
- Describe the process of birth.
Multiple-Choice Quizzes and Answers
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 permeable barrier, its molecules use osmosis or diffusion to move through the barrier 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. Repel 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

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. Spong 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. Osteoblasts, 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. Intervertebral

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. Synchronondosis
   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. Circular motion
   d. All of the above

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

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

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. Tibialis posterior
   ✔ c. Fibularis longus and fibularis brevis
   d. Tibialis anterior and tibialis posterior
   ✔ d. Gastrocnemius and soleus

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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. Urine production  ✔
   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)
   ✔ 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
   ✔ c. Vertebral column
d. Thyroid gland

6. The pineal gland produces the hormone ______, which protects nervous tissue and regulates sleeping patterns.
   a. Glucagon
   ✔ b. Melanin
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. Melanin

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
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

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

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### 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
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. The four lobes of the liver are the:
   a. Anterior, posterior, right, left
   b. Right, hepatic, left, quadrate
   ✔ c. Caudate, left, quadrate, right
   d. Triangular, cardiac, left, right

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
d. Dartos, glans
c. Corpus spongiosum, corpora cavernosa

d. Bulbospongious, 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
da. 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 ovum 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 ovum has developed into a ________, it implants on the uterine wall.
   a. Zygote
   b. Morula
   c. Embryo
   d. 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
Dissection Quiz Listing
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.

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 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.

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.

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.

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 median 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.

**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.

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 the right or left 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 (bicuspis).
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.

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.

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.
<table>
<thead>
<tr>
<th>Marieb Chapter Name</th>
<th>Visible Body’s Anatomy &amp; Physiology Unit</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1: The Human Body: An Orientation</td>
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<td></td>
</tr>
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<td></td>
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</tbody>
</table>
### Syllabus Correlation for *Human Anatomy & Physiology, 9th Edition*
by Elaine N. Marieb and Katja Hoehn

<table>
<thead>
<tr>
<th>Marieb Chapter Name</th>
<th>Visible Body’s Anatomy &amp; Physiology Unit</th>
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<tr>
<td>Chapter 1: The Human Body: An Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 2: Chemistry Comes Alive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 3: Cells: The Living Units</td>
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<td>Three new animations on cellular respiration, transcription, and translation.</td>
</tr>
<tr>
<td>Chapter 4: Tissue: The Living Fabric</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
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</tr>
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</tr>
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<td>Chapters 17-23: Nervous System and Special Senses</td>
<td>3D models of the brain, spinal cord and spinal nerves showing anatomy and innervation.</td>
</tr>
<tr>
<td>Chapter 13: The Peripheral Nervous System and Reflex Activity</td>
<td>Chapters 17-23: Nervous System and Special Senses</td>
<td>Includes animations and 3D models of somatic and autonomic functions as well as somatic sensory signals and skin sensory receptors.</td>
</tr>
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<td>Chapter 14: The Autonomic Nervous System</td>
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<td>3D model to convey autonomic nervous functions.</td>
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<td>More than 55 assets detailing arteries and veins in 3D.</td>
</tr>
<tr>
<td>Chapter 20: The Lymphatic System and Lymphoid Organs and Tissues</td>
<td>Chapters 31-33: Lymphatic System</td>
<td>3D models of key organs as well as vessels and veins and lymph node function and distribution.</td>
</tr>
<tr>
<td>Chapter 21: The Immune System: Innate and Adaptive Body Defenses</td>
<td>Chapters 31-33: Lymphatic System</td>
<td>Phagocytosis animation and illustrations on innate immunity, adaptive immunity, and types of white blood cells. 3D models of B and T cells.</td>
</tr>
<tr>
<td>Chapter 22: The Respiratory System</td>
<td>Chapters 34-37: Respiratory System</td>
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</tr>
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<td>Chapter 24: Nutrition, Metabolism, and Body Temperature Regulation</td>
<td>Chapters 38-42: Digestive System; Chapters 24-26: The Endocrine System</td>
<td>3D models include the pancreas and pancreatic islets, and hypothalamus.</td>
</tr>
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</tr>
<tr>
<td>Chapter 26: Fluid, Electrolyte, and Acid-Base Balance</td>
<td>Chapters 43-46: Urinary System</td>
<td>Animations include reabsorption and secretion.</td>
</tr>
<tr>
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<td>Chapters 47-50: Reproductive System</td>
<td>Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis.</td>
</tr>
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<td>Chapter 28: Pregnancy and Human Development</td>
<td>Chapters 47-50: Reproductive System</td>
<td>Models and illustrations cover ovulation, path of the zygote, and birth. Animations show lactation and fetal development.</td>
</tr>
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<td>Martini Chapter Name</td>
<td>Visible Body’s Anatomy &amp; Physiology Unit</td>
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</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Chapter 1: An Introduction to Anatomy and Physiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 2: The Chemical Level of Organization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 3: The Cellular Level of Organization</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>Three new animations on cellular respiration, transcription, and translation.</td>
</tr>
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</tr>
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<td>Chapter 6: Osseous Tissue and Bone Structure</td>
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</tr>
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<td>Chapters 17-23: Nervous System and Special Senses</td>
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</tr>
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<td>Chapter 16: Neural Integration II: The Autonomic Nervous System and Higher-Order Functions</td>
<td>Chapters 17-23: Nervous System and Special Senses</td>
<td>3D model to convey autonomic nervous functions.</td>
</tr>
<tr>
<td>Chapter 17: The Special Senses</td>
<td>Chapters 23: Special Senses</td>
<td>3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, ears and hearing.</td>
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<td>---------</td>
<td>--------------</td>
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</tr>
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</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Chapter 1: The Sciences of Anatomy and Physiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 2: Atoms, Ions, and Molecules</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>New animation on cellular respiration.</td>
</tr>
<tr>
<td>Chapter 3: Energy, Chemical Reactions, and Cellular Respiration</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>In-depth animations and illustrations of transcription and translation.</td>
</tr>
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<td>Chapter 4: Biology of the Cell</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>3D models explore epithelial, connective, and muscle tissue. Tissue repair and</td>
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<td>More than 55 assets detailing arteries and veins in 3D.</td>
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<td>Chapter 21: Lymphatic System</td>
<td>Chapters 31-33: Lymphatic System</td>
<td>3D models of key organs as well as vessels and veins and lymph node function and distribution.</td>
</tr>
<tr>
<td>Chapter 22: Immune System and the Body’s Defense</td>
<td>Chapters 31-33: Lymphatic System</td>
<td>Phagocytosis animation and illustrations on innate immunity, adaptive immunity, and types of white blood cells. 3D models of B and T cells.</td>
</tr>
<tr>
<td>Chapter 23: Respiratory System</td>
<td>Chapters 34-37: Respiratory System</td>
<td>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.</td>
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<td>Chapters 47-50: Reproductive System</td>
<td>Male and female reproductive anatomy, including animations on spermatogenesis and oogenesis.</td>
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</tbody>
</table>
## Syllabus Correlation for *Anatomy & Physiology: The Unity of Form and Function, 6th Edition*
by Kenneth S. Saladin

<table>
<thead>
<tr>
<th>Saladin Chapter Name</th>
<th>Visible Body’s Anatomy &amp; Physiology Unit</th>
<th>Key Highlights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1: Major Themes of Anatomy and Physiology; Atlas A: General Orientation to Human Anatomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 2: The Chemistry of Life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 3: Cellular Form and Function</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>New animation on cellular respiration.</td>
</tr>
<tr>
<td>Chapter 4: Genetics and Cellular Function</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>In-depth animations and illustrations of transcription and translation.</td>
</tr>
<tr>
<td>Chapter 5: Histology</td>
<td>Chapters 1-4: Cells &amp; Tissue</td>
<td>3D models showing anatomy of all major parts of the cell.</td>
</tr>
<tr>
<td>Chapter 6: The Integumentary System</td>
<td>Chapters 5-6: Integumentary System</td>
<td>Stunning animation on tissue repair. 3D models of epidermis and dermis layers.</td>
</tr>
<tr>
<td>Chapter 7: Bone Tissue</td>
<td>Chapters 7-9: Skeletal System and Joints</td>
<td>Animations on formation of flat bones, long bones, and bone repair.</td>
</tr>
<tr>
<td>Chapter 8: The Skeletal System</td>
<td>Chapters 7-9: Skeletal System and Joints</td>
<td>Now with 3D models that include key bony landmarks of all of the major bones.</td>
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<td>Chapter 9: Joints</td>
<td>Chapter 12: Joints</td>
<td>Animations showing movement of all joint types.</td>
</tr>
<tr>
<td>Chapter 10: The Muscular System; Atlas B: Regional and Surface Anatomy</td>
<td>Chapters 13-16: Muscle Tissue and Muscular System</td>
<td>More than 50 3D models of muscle groups.</td>
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<td>Two new animations on skeletal muscle contraction featuring action potential and cross-bridge formation.</td>
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<td>Chapter 13: The Spinal Cord, Spinal Nerves, and Somatic Reflexes</td>
<td>Chapters 17-23: Nervous System and Special Senses</td>
<td>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.</td>
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<td>3D model to convey autonomic nervous functions.</td>
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<tr>
<td>Chapter 16: Sense Organs</td>
<td>Chapters 23: Special Senses</td>
<td>3D models and animations on olfactory pathway and process of olfaction, tongue and taste, eyes and vision, ears and hearing.</td>
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<td>Chapters 24-26: Endocrine System</td>
<td>Animation on hormone actions, as well as 3D models and explanation of major organs and functions.</td>
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<td>Chapter 19: The Circulatory System: The Heart</td>
<td>Chapter 27: Introduction; Chapter 29: Heart</td>
<td>More than 25 assets on anatomy in 3D, including animations on heart chambers, heart valves, heart conduction, and more.</td>
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<td>Chapter</td>
<td>System(s)</td>
<td>Additional Information</td>
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<td>The Lymphatic and Immune Systems</td>
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</tr>
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<td>Three new animations on cellular respiration, transcription, and translation.</td>
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