

# Anatomy and Physiology: Grades 9, 10, 11, 12

Adopted 2022

## Levels of Organization in the Human Body

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- HS-AP1-1.** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis in humans. [HS-AP1-1](#)
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- HS-AP1-2.** Develop and use a model to illustrate the hierarchical organization of structural body systems that provide specific functions within the Human Body. [HS-AP1-2](#)
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- HS-AP1-3.** Compare and contrast the relationships among the various tissue types as well as the molecular and cellular composition of these tissues. [HS-AP1-3](#)
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- HS-AP1-4.** Compare and contrast the histological structure between the 4 basic tissue types. [HS-AP1-4](#)
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- HS-AP1-5.** Compare and contrast the major organ systems and describe their basic functional importance. [HS-AP1-5](#)
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- HS-AP1-6.** Identify anatomical terms (including anatomical orientation, regions, planes) on a diagram, model, or through dissection. [HS-AP1-6](#)
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## Movement and Support, the Integumentary System

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- HS-AP2-1.** Analyze the structural characteristics and functional importance of the integumentary system to maintain homeostasis of the body. [HS-AP2-1](#)
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- HS-AP2-2.** Evaluate and explain the consequence of injury (e.g., Burns) and/or disease (e.g., skin cancer, vitiligo) to the functionality of the integumentary system. [HS-AP2-2](#)
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## Movement and Support, the Skeletal System

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- HS-AP3-1.** Develop a model to illustrate the microscopic structure, development of, maintenance of, and function of compact and spongy bone. [HS-AP3-1](#)
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- HS-AP3-2.** Observe the characteristics of a bone from the axial or appendicular skeleton. Then construct an argument to support how the structure determines the function. [HS-AP3-2](#)
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- HS-AP3-3.** Locate and identify individual bones of the axial and appendicular skeleton and unique features of bones. [HS-AP3-3](#)
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**HS-AP3-4.** Compare and contrast the different types of bone (e.g., long, short, flat, and irregular). [HS-AP3-4](#)

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**HS-AP3-5.** Compare and contrast the major types of joints and construct an argument how these structural components influence functional mobility and stability. [HS-AP3-5](#)

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## **Movement and Support, the Muscular System**

**HS-AP4-1.** Compare and contrast between the structural and functional characteristics of skeletal, cardiac, and smooth muscle. [HS-AP4-1](#)

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**HS-AP4-2.** Develop a model to illustrate the components of a muscle fiber and how they interact in contraction and relaxation. [HS-AP4-2](#)

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**HS-AP4-3.** Conduct an investigation to analyze the molecular processes involved in sliding filament models to explain and identify changes in disease-related illnesses. [HS-AP4-3](#)

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**HS-AP4-4.** Describe how a neuromuscular junction functions. Design an experiment to determine how motor recruitment influences the force and velocity of contraction. [HS-AP4-4](#)

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**HS-AP4-5.** Use a diagram, model, or dissection to identify major muscle groups. [HS-AP4-5](#)

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**HS-AP4-6.** Compare and contrast between isotonic and isometric contractions and construct an explanation for the causes of hypertrophy and atrophy of muscles. [HS-AP4-6](#)

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## **Integration and Coordination, the Nervous System**

**HS-AP5-1.** Develop a model that illustrates the structural components and functional subdivisions of the nervous system. [HS-AP5-1](#)

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**HS-AP5-2.** Observe and identify the structure and function of the various neurons and neuroglia. Explain how the varying structures determine the specified function. [HS-AP5-2](#)

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**HS-AP5-3.** Compare and contrast the actions, origins, and pathways of nerve fibers in the parasympathetic and sympathetic divisions of the autonomic nervous system. [HS-AP5-3](#)

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**HS-AP5-4.** Identify and model how action potentials are generated, via neurotransmitters, the ions and channel protein involved, and the basic structural and functional aspects which allow for synaptic connection. [HS-AP5-4](#)

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**HS-AP5-5.** Identify the various classification of neurotransmitters and their associated functions. Describe how certain disease states can be caused by interruption of neurotransmitters. [HS-AP5-5](#)

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## Integration and Coordination, Somatic and Special Senses

- HS-AP6-1.** Compare and contrast the somatic, visceral, and special senses, the prominent sensory receptor types of each, and their functional operation. [HS-AP6-1](#)
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- HS-AP6-2.** Make and/or use a model of the anatomy of the eye; then construct an explanation for hyperopia, myopia and astigmatism using the model. [HS-AP6-2](#)
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- HS-AP6-3.** Make and/or use a model of the anatomy of the ear. Construct an explanation for sensorineural and conductive hearing loss using the basic structure and function of the ear. [HS-AP6-3](#)

## Integration and Coordination, the Endocrine System

- HS-AP7-1.** Investigate the structure and function of the endocrine system and develop models showing how changes in prominent hormone levels impact homeostasis throughout the body systems. [HS-AP7-1](#)
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- HS-AP7-2.** Assess the structural and functional differences between an endocrine gland and an exocrine gland. [HS-AP7-2](#)
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- HS-AP7-3.** Compare and contrast the hormones of the hypothalamus-pituitary complex. Analyze the function of each hormone and connect them to feedback signals for the gonads, thyroid, and adrenal cortex. [HS-AP7-3](#)
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- HS-AP7-4.** Construct an explanation to show the impact of stress on the hypothalamus-pituitary complex, sympathetic nervous system, and the adrenal medulla. [HS-AP7-4](#)
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- HS-AP7-5.** Construct an explanation for maintaining blood sugar levels via endocrine and exocrine functions of the pancreas. [HS-AP7-5](#)

## Transport, Blood and the Cardiovascular System

- HS-AP8-1.** Perform an investigation to identify the composition and function of whole blood components, and the role they play in maintaining homeostasis. [HS-AP8-1](#)
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- HS-AP8-2.** Conduct an investigation to learn about the ABO blood type. Discuss how the surface-antigens and plasma antibodies allow and/or disallow for certain blood transfusions. [HS-AP8-2](#)
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- HS-AP8-3.** Investigate the primary structures of the cardiovascular system and explore their functional importance to maintaining homeostasis. [HS-AP8-3](#)
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- HS-AP8-4.** Create a model of vasoconstriction and vasodilation to demonstrate the structural and functional difference between arteries and veins. [HS-AP8-4](#)
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- HS-AP8-5.** Use a diagram and/or a model of the heart to illustrate the external and internal structures, the vessels entering and exiting, unidirectional blood flow and how the heart supports pulmonary and cardiac circulation. [HS-AP8-5](#)

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**HS-AP8-6.** Construct a model of hypertension to model the regulation of the cardiac cycle. [HS-AP8-6](#)

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**HS-AP8-7.** Design an experiment to illustrate how the cardiovascular system maintains homeostasis. [HS-AP8-7](#)

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**Transport, the Lymphatic System and Immune Mechanisms**

**HS-AP9-1.** Identify the primary structural and functional components of the lymphatic system. [HS-AP9-1](#)

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**HS-AP9-2.** Analyze the relationship of the components of the lymphatic system with bone marrow and the thymus gland. [HS-AP9-2](#)

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**HS-AP9-3.** Differentiate between innate and acquired immunity. [HS-AP9-3](#)

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**HS-AP9-4.** Construct an explanation for defense against foreign pathogens using cellular and non-cellular components of the immune response. [HS-AP9-4](#)

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**Absorption and Excretion, the Digestive System**

**HS-AP10-1.** Identify and locate major and accessory organs of the digestive system and investigate their physiological functions. [HS-AP10-1](#)

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**HS-AP10-2.** Construct an explanation for enzymes involved in the processing of, digestion of and absorbance of macromolecules. [HS-AP10-2](#)

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**HS-AP10-3.** Compare and contrast mechanical and chemical digestion. [HS-AP10-3](#)

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**HS-AP10-4.** Differentiate between metabolic and respiratory acidosis and alkalosis. [HS-AP10-4](#)

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**Absorption and Excretion, the Respiratory System**

**HS-AP11-1.** Identify and locate major organs of the respiratory system and discuss their functions. Differentiate between the components of the upper and lower respiratory systems. [HS-AP11-1](#)

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**HS-AP11-2.** Observe the anatomical structures and explain the physiological processes involved in inspiration & expiration. [HS-AP11-2](#)

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**HS-AP11-3.** Analyze data to investigate how percentages and partial pressure gradients of oxygen and carbon dioxide impact net gas exchange. [HS-AP11-3](#)

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**HS-AP11-4.** Construct an explanation for maintaining blood pH via specialized carbon dioxide receptors and the respiratory response. [HS-AP11-4](#)

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**Absorption and Excretion, the Urinary System**

**HS-AP12-1.** Identify and locate major organs of the urinary system and discuss their functions. [HS-AP12-1](#)

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**HS-AP12-2.** Observe and identify the structures of the kidney; then construct an explanation for maintaining blood volume via kidney function. [HS-AP12-2](#)

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**HS-AP12-3.** Develop a model of the nephron to explore its structural components, associated hormones, and the functional processes of filtration, excretion, secretion, and reabsorption. [HS-AP12-3](#)

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**Life Cycle, the  
Reproductive System**

**HS-AP13-1.** Identify and locate major and accessory organs of the female and male reproductive systems and discuss their functions. [HS-AP13-1](#)

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**HS-AP13-2.** Create a diagram or model to analyze the role of hormones in the male and female reproductive system. [HS-AP13-2](#)

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**HS-AP13-3.** Describe how spermatozoa move through the female reproductive tract and describe the process of fertilization. [HS-AP13-3](#)

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**HS-AP13-4.** Construct an explanation of the rise of the three primary germ layers via zygote creation, blastocyst development and gastrulation process. [HS-AP13-4](#)

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**HS-PS13-5.** Describe the stages of embryonic development after gastrulation, up to the birth of a baby. [HS-PS13-5](#)