Indiana Science

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

Adopted 2022

Levels of Organization in the Human Body	HS-AP1-1.	Plan and conduct and investigation to provide evidence that feedback mechanisms maintain homeostasis in humans. HS-AP1-1
	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
	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
	HS-AP1-4.	Compare and contrast the histological structure between the 4 basic tissue types. HS-AP1-4
	HS-AP1-5.	Compare and contrast the major organ systems and describe their basic functional importance. HS-AP1-5
	HS-AP1-6.	Identify anatomical terms (including anatomical orientation, regions, planes) on a diagram, model, or through dissection. HS-AP1-6
Movement and Support, the Integumentary System	HS-AP2-1.	Analyze the structural characteristics and functional importance of the integumentary system to maintain homeostasis of the body. HS-AP2-1
	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
Movement and Support, the Skeletal System	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
	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
	HS-AP3-3.	Locate and identify individual bones of the axial and appendicular skeleton and unique features of bones. HS-AP3-3

	HS-AP3-4.	**Compare and contrast the different types of bone (e.g., long, short, flat, and irregular.** HS-AP3-4
	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
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
	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
	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
	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
	HS-AP4-5.	**Use a diagram, model, or dissection to identify major muscle groups.** HS-AP4-5
	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
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
	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
	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
	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
	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

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
	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
	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
	HS-AP7-2.	**Assess the structural and functional differences between an endocrine gland and an exocrine gland.** HS-AP7-2
	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
	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
	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
	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
	HS-AP8-3.	**Investigate the primary structures of the cardiovascular system and explore their functional importance to maintaining homeostasis.** HS-AP8-3
	HS-AP8-4.	**Create a model of vasoconstriction and vasodilation to demonstrate the structural and functional difference between arteries and veins.** HS-AP8-4
	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

	HS-AP8-6. Construct a model of hypertension to model the regulation of the cardiac cycle. HS-AP8-6
	HS-AP8-7. Design an experiment to illustrate how the cardiovascular system maintains homeostasis. HS-AP8-7
Transport, the Lymphatic System and Immune Mechanisms	**HS-AP9-1.** Identify the primary structural and functional components of the lymphatic system. HS-AP9-1
	HS-AP9-2. Analyze the relationship of the components of the lymphatic system with bone marrow and the thymus gland. HS-AP9-2
	HS-AP9-3. Differentiate between innate and acquired immunity. HS-AP9-3
	HS-AP9-4. Construct an explanation for defense against foreign pathogens using cellular and non-cellular components of the immune response. HS-AP9-4
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
	HS-AP10-2. Construct an explanation for enzymes involved in the processing of, digestion of and absorbance of macromolecules. HS-AP10-2
	HS-AP10-3. Compare and contrast mechanical and chemical digestion. HS-AP10-3
	HS-AP10-4. Differentiate between metabolic and respiratory acidosis and alkalosis. HS-AP10-4
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
	HS-AP11-2. Observe the anatomical structures and explain the physiological processes involved in inspiration & expiration. HS-AP11-2
	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
	HS-AP11-4. Construct an explanation for maintaining blood pH via specialized carbon dioxide receptors and the respiratory response. HS-AP11-4
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
	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

	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
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
	HS-AP13-2.	**Create a diagram or model to analyze the role of hormones in the male and female reproductive system.** HS-AP13-2
	HS-AP13-3.	**Describe how spermatozoa move through the female reproductive tract and describe the process of fertilization.** HS-AP13-3
	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
	HS-PS13-5.	**Describe the stages of embryonic development after gastrulation, up to the birth of a baby.** HS-PS13-5