



Anatomy and Physiology I

Approved by KSD Board of Education: 2019

Course Description:

Anatomy and Physiology is a course that will enable students to develop an understanding of the relationships between the structures and functions of the human body. Students will also learn the mechanisms for maintaining homeostasis and the impacts of damage and diseases on the body systems.

Grade Level: 10th-12th

Unit Scope and Sequence

Unit 1: Human Body Plan

Unit 2: Skeletal, Muscular, and Integumentary Systems

Unit 3: Digestive System and Nutrition

Unit 4: Excretory and Urinary Systems

Course Enduring Understandings:

- Students will understand that the organization of the human body is a complex and hierarchical system,
- Students will understand that the anatomy and physiology of the body systems are fundamental to how the human body functions as an integrated whole.
- Students will identify the structures and functions of each system, which is crucial for understanding their roles in maintaining homeostasis, supporting life processes, and enabling the body to respond to internal and external changes.
- Students will develop a comprehensive knowledge of these systems, which forms the basis for analyzing health, diagnosing medical conditions, and developing effective treatments.

Course Essential Questions:

- How do the different levels of human structures—organelles, cells, tissues, organs, and organ systems—work together to maintain homeostasis, and how do disruptions at these levels lead to disease?
- How can we use anatomical terms effectively to accurately describe the features and positions of structures within the human body?

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Unit 1: Human Body Plan

In this unit, students will explore the fundamental principles that define the organization and function of the human body. The focus will be understanding how various structures, from the smallest cellular components to entire organ systems, work together to maintain stability and support life. Students will engage with key concepts such as anatomical planes, directional terms, body cavities, tissue structure and function, and the mechanisms that regulate cellular homeostasis. Through this exploration, they will learn how to apply these concepts to both healthy states and pathological conditions.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- Understanding the organization of the human body as a complex and hierarchical system. - Recognizing anatomical planes, directional terms, and body cavities as essential tools for describing and analyzing body structures. - Comprehending the roles of different types of tissues and their importance in maintaining homeostasis and responding to disease. - Analyzing the levels of organization, from organelles to organ systems, to understand how these contribute to the overall function of the human body.	- How does the hierarchical organization of the human body, from cells to organ systems, enable it to maintain stability and respond to changes in both healthy and diseased states? - In what ways do anatomical planes, directional terms, and body cavities help us accurately describe and understand the location and function of structures within the human body? - How do different types of tissues contribute to the overall structure and function of the body, and what role do they play in maintaining cellular homeostasis and responding to pathological conditions?
<i>Students must know:</i>	<i>Students must be able to:</i>
- Coronal - Sagittal - Transverse - Superior - Inferior - Distal - Proximal - Medial - Lateral - Anterior - Posterior - Dorsal - Ventral - Thoracic - Abdominopelvic - Cranial - Pelvic	- Accurately differentiate the levels of organization within the human body (organelles, cells, tissues, organs, organ systems) and analyze how these structures interact to maintain homeostasis and respond to diseases. - Effectively use anatomical planes, directional terms, and body cavity terminology to describe the positions and relationships of body structures in both written and verbal communication. - Evaluate the structure and function of different tissue types and apply this knowledge to identify changes that indicate tissue pathology or disease, using concepts like cellular homeostasis and the cell cycle.

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Unit 1: Human Body Plan

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Unit 1: Human Body Plan

Missouri Learning Standards

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells (HS-LS1-1).

Supporting Standards:

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, and peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future (HS-LS1-1).
- Systems of specialized cells within organisms help them perform the essential functions of life (HS-LS1-1).
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells (HS-LS1-1).
- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem (HS-LS1-1)

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (HS-LS1-2).

Supporting Standards:

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system (HS-LS1-2).
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level (HS-LS1-2).
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales (HS-LS1-2).

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis (HS-LS1-3).

Supporting Standards:

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly (HS-LS1-3).
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system (HS-LS1-3).

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Unit 2: Skeletal, Muscular and Integumentary Systems

In this unit, students will explore the anatomy and physiology of the skeletal, muscular, and integumentary systems, exploring their structures, functions, and interdependencies. By comprehensively examining these systems, students will learn how they work together to maintain homeostasis, facilitate movement, and protect the body. The unit will also address the impact of diseases and injuries on these systems, enabling students to assess how structural changes affect function.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- The skeletal, muscular, and integumentary systems are interdependent structures that collectively support movement, protect vital organs, and maintain overall homeostasis in the human body. - Knowledge of diseases and injuries affecting the skeletal, muscular, and integumentary systems is crucial for assessing their impact on body function and overall health, highlighting the importance of preventive measures and interventions. - The intricate processes of bone remodeling, muscle contraction, and skin protection illustrate the dynamic nature of these systems, demonstrating how they adapt to internal and external changes throughout an individual's life.	- How do the structures and functions of the skeletal, muscular, and integumentary systems work together to maintain the body's overall health and functionality, and what happens when one of these systems is compromised? - How can understanding the anatomy and physiology of the skeletal and muscular systems enhance our ability to prevent, diagnose, and treat injuries or diseases affecting these systems? - How do environmental factors, such as UV radiation and physical activity, influence the health and functionality of the integumentary system, and what implications does this have for individuals living in diverse conditions?
<i>Students must know:</i>	<i>Students must be able to:</i>
- Axial - Appendicular - Insertion - Origin - Antagonist - Contraction - Sliding Filament Theory - Osteoclast - Osteoblast - Osteocyte - Osteoporosis - Bone Remodeling - Fracture - Sprain - Strain - Anatomical Terms for Bones and Muscles (see Appendix A)	- Accurately identify and describe the structures and functions of the skeletal, muscular, and integumentary systems using appropriate anatomical terminology and visual aids. - Analyze the interdependencies between these systems, explaining how they work together to support movement, protect the body, and maintain homeostasis. - Apply their understanding of these systems to real-world scenarios, such as evaluating the impact of lifestyle choices on health, designing injury prevention strategies, or discussing the role of skin pigmentation in different environments.

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Unit 2: Skeletal, Muscular and Integumentary Systems

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| <ul style="list-style-type: none">• Dermis• Epidermis• Hypodermis• Melanocytes• Sebaceous Gland• Acetylcholine• ATP• Fibrous (joints)• Cartilaginous (joints)• Synovial (joints)• Flexion• Extension• Adduction• Abduction• Circumduction | |
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Unit 2: Skeletal, Muscular and Integumentary Systems

Missouri Learning Standards

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells (HS-LS1-1).

Supporting Standards:

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, and peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future (HS-LS1-1).
- Systems of specialized cells within organisms help them perform the essential functions of life (HS-LS1-1).
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells (HS-LS1-1).
- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem (HS-LS1-1))

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (HS-LS1-2).

Supporting Standards:

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system (HS-LS1-2).
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level (HS-LS1-2).
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales (HS-LS1-2).

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis (HS-LS1-3).

Supporting Standards:

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly (HS-LS1-3).
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system (HS-LS1-3).

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Unit 3: Digestive System and Nutrition

In this unit, students will explore the digestive system's complexities and nutrition's role in maintaining overall health. The unit covers the anatomy and physiology of the digestive system, the processes involved in digestion, and the critical importance of nutrients in supporting bodily functions. Students will also investigate the consequences of malnutrition and its relationship with various medical and social factors. Through hands-on activities, including fetal pig dissection, students will better understand digestive structures and functions while comparing them to human anatomy.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- The digestive system works in concert with other bodily systems to facilitate the ingestion, digestion, and absorption of nutrients essential for sustaining life and maintaining homeostasis. - Understanding the roles of macronutrients and micronutrients is crucial for making informed dietary choices, as proper nutrition directly influences overall health and can prevent various health issues, including malnutrition. - Diseases and disorders of the digestive system can significantly affect overall health, highlighting the importance of recognizing symptoms, seeking appropriate treatment, and understanding the social, economic, and environmental factors contributing to these issues.	- How do the structures and functions of the digestive system contribute to the body's ability to process food and absorb nutrients, and what can go wrong if any part of this system fails? - How does nutrition affect the health of the digestive system and the body as a whole, and how can dietary choices mitigate or exacerbate health issues? - How do social, economic, and environmental factors influence the prevalence of malnutrition and other digestive disorders across different populations?
<i>Students must know:</i>	<i>Students must be able to:</i>
- peristalsis - propulsion - ingestion - defecation - chemical digestion - enzymes - pepsin - amylase - lipases - bile - alimentary canal - proteases - accessory organ - pharynx - epiglottis - esophagus - cardiac sphincter - stomach	- Accurately identify the major structures of the digestive system, including the alimentary canal and accessory organs, and describe their specific functions in the digestive process. - Analyze the digestive processes in various organs and predict the effects of disruptions or diseases within the digestive system on overall health. - Evaluate the roles of macronutrients and micronutrients in the body, including their sources, functions, and the consequences of deficiencies or excesses. - Utilize an animal model, such as fetal pig dissection, to compare anatomical features and functions of the digestive system with those of humans, reinforcing the understanding of structure-function

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Unit 3: Digestive System and Nutrition

• pyloric sphincter • duodenum • jejunum • ileum • colon • cecum • appendix • rectum • anus • gall bladder • liver • pancreas • bile duct • pancreatic duct • salivary glands • mesentery • mucosa • submucosa • muscularis • serosa • chief cells • parietal cells • enteroendocrine cells • gastrin • gastric glands • macronutrient • micronutrient • complete protein • incomplete protein • vitamin • mineral • malnutrition • fat soluble • water-soluble	relationships in biological systems.
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Unit 3: Digestive System and Nutrition

Missouri Learning Standards

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Unit 4: Excretory and Urinary Systems

In this unit, students will explore the excretory and urinary systems, focusing on their structures, functions, and interrelationships. Students will learn how these systems work to eliminate waste, maintain homeostasis, and respond to diseases or disorders. The unit will also cover the processes involved in urine production and the significance of urinalysis in assessing kidney and urinary health.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- The excretory and urinary systems are essential for maintaining homeostasis by regulating the composition of body fluids and eliminating waste products, highlighting the interconnectedness of bodily systems in sustaining health. - Understanding the structures and functions of the excretory and urinary systems enables students to recognize how diseases and disorders can disrupt these processes, leading to significant health challenges that require early intervention and management.	- How do the excretory and urinary system structures work together to filter blood, produce urine, and maintain homeostasis within the body? - What are the potential health impacts of disorders affecting the excretory and urinary systems, and how can early detection and treatment mitigate these effects?
<i>Students must know:</i>	<i>Students must be able to:</i>
- excretion - urea - uric acid - ammonia - renal cortex - renal medulla - renal pelvis - ureter - urethra - urinary bladder - nephron - Bowman's capsule - glomerulus - proximal convoluted tubule - loop of Henle - distal convoluted tubule - collecting duct - secretion - reabsorption - toxin - prostate	- Accurately identify the major structures of the excretory and urinary systems, including the kidneys, nephrons, ureters, urinary bladder, and urethra, and describe their specific functions in waste removal and fluid balance. - Connect the excretory and urinary systems with other bodily systems (such as the digestive and circulatory systems) to understand their interdependence in maintaining overall health. - Evaluate the impact of diseases and disorders on the excretory and urinary systems and articulate how such conditions can affect overall health and homeostasis.

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Unit 4: Excretory and Urinary Systems

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