

Science

Unit/Timeframe: Biology Unit 5: Human Body Systems / Up to 6 weeks	Grade Level: 9, 10, 11, 12
Content Standards	2017 MA Literacy Framework
<u>Standard #1: HS-LS1-2: Human Body Systems</u> Develop and use a model to illustrate the key functions of animal body systems, including (a) food digestion, nutrient uptake, and transport through the body; (b) exchange of oxygen and carbon dioxide; (c) removal of wastes; and (d) regulation of body processes. <u>State's Clarification Statement:</u> Emphasis is on the primary function of the following body systems (and structures): digestive (mouth, stomach, small intestine [villi], large intestine, pancreas), respiratory (lungs [alveoli], diaphragm), circulatory (heart, veins, arteries, capillaries), excretory (kidneys, liver, skin), and nervous (neurons, brain, spinal cord). <u>State Assessment Boundary/ Possible Extension Topic for Honors:</u> Chemical reactions in cells, details of particular structures (such as the structure of the neuron), or the identification of specific proteins in cells are not expected in state assessment. <u>Standard #2: HS-LS1-3: Homeostasis (PARTIAL COVERAGE)</u> Provide evidence that homeostasis maintains internal body conditions through both body-wide feedback mechanisms and small-scale cellular processes. <u>State's Clarification Statement:</u> Feedback mechanisms include the promotion of a stimulus through positive feedback (e.g., injured tissues releasing chemicals in blood that activate platelets to facilitate blood clotting), and the inhibition of stimulus through negative feedback (e.g., insulin reducing high blood glucose to normal levels). Cellular processes include (a) passive transport and active transport of materials across the cell membrane to maintain specific concentrations of water and other nutrients in the cell and (b) the role of lysosomes in recycling wastes, macromolecules, and cell parts into monomers. Taught in a previous unit.	SL.11-12.5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)

<u>State Assessment Boundary/ Possible Extension Topic for Honors:</u> Interactions at the molecular level (for example, how insulin is produced) are not expected in state assessment. <u>WPS Clarification Statement:</u> Cell transport mechanisms were taught in a previous unit. The applications of cell transport mechanisms, especially diffusion and osmosis in the respiratory, circulatory, digestive and excretory systems should be emphasized. The remaining parts of this standard not previously covered should be taught now.	
Essential Questions	Skills/Knowledge
<u>Possible Phenomena:</u> ● Runner's high (see Common Resources) <u>Essential Questions:</u> ● How do organisms obtain and use the matter and energy they need to live and grow? ● Do organisms detect, process and use information about the environment? ● How are the human body systems organized? ● How do negative and positive feedback mechanisms maintain homeostasis?	<u>Students should be able to:</u> <u>State Provided Objectives:</u> ● Explain how different body systems work together to maintain life functions including how red blood cells carry oxygen to body cells, and how villi transfer nutrients to the blood for body cells. ● Analyze, explain, and complete a model showing how negative and positive feedback loops help to maintain homeostasis within an organism, including when the feedback loop is not functioning properly. ● Communicate information about how hormones travel through the bloodstream to bind with receptors on target cells to regulate body processes. <u>WP</u> <u>S Objectives:</u> ● List the levels of biological organization in order from cell through organism ● Describe how any given body system interacts with a second body system ● Define homeostasis ● Explain the role of negative feedback mechanisms in maintaining dynamic homeostasis, and provide an example of a negative feedback mechanism ● Compare negative and positive feedback mechanisms ● List the organs of the digestive system in the order in which food passes through them ● Describe the digestive function of the following organs: mouth, stomach, small intestine, large intestine, pancreas

	● Contrast mechanical and chemical digestion ● Describe the excretory function of each of the following organs: kidneys, liver, skin ● Provide two examples of waste products that must be excreted by the body ● Describe the relationship between blood and urine ● Label the parts of a neuron ● Describe how the three types of neurons work in conjunction to allow the body to respond to a stimulus ● Explain the role of neurotransmitters in relaying messages from one neuron to another ● Circle the location on a diagram where neurotransmitters would be found ● Name the parts of the central nervous system ● Label a diagram of the four chambers of the heart ● Distinguish among the following terms, based on both the diameter of the blood vessel, and the direction of blood flow: artery, arteriole, capillary, venule, vein ● Describe how the diaphragm muscle controls the mechanics of breathing ● Model the exchange of oxygen and carbon dioxide between the bloodstream and body tissues and the bloodstream and alveoli
Common Resources	Common Assessments
Homeostasis Graphing Worksheets Runner's High Controlling Blood Glucose Medical Mystery Middle School Unit (adaptable and appropriate for high school level)	Identify two human body systems that interact via the process of diffusion. Describe the material that is diffusing, the direction in which it moves, and how this helps to maintain the organism's homeostasis.
Vocabulary	
Tier II: Homeostasis, feedback, induce, inhibit, stimulus, positive feedback, negative feedback, insulin, Tier III:	
Additional Notes	
Prior Knowledge:	

Overall function of circulatory, digestive, respiratory, excretory, muscular/skeletal and nervous systems, as well as how the systems as a whole interact, was taught in 6th grade. Specific organs and their functions were not taught.

Practice	Description	Example for this Unit
<i>Practice #1: Asking Questions and Defining Problems</i>	Scientific questions lead to explanations of how the natural world works and can be empirically tested using evidence.	Present students with details about a real or fictional person who has a mysterious illness (see Medical Mystery in Common Resources) and ask students to generate questions about the scenario
<i>Practice #2: Developing and Using Models</i>	A model is an abstract representation of phenomena that is a tool used to predict or explain the world. Models can be represented as diagrams, 3-D objects, mathematical representations, analogies or computer simulations	Controlling Blood Glucose Levels Learning Mat/Storyboard Activity (see Common Resources)
<i>Practice #4: Analyzing and Interpreting Data</i>	Analyzing and interpreting data includes making sense of the data produced during investigations. Because patterns are not always obvious, this includes using a range of tools such as tables, graphs and other visualization techniques.	Homeostasis Graphing Worksheets (see Common Resources)