



BPS Science Department Anatomy and Physiology

Anatomy and Physiology – Unit 9 - The Cardiovascular System: The Heart (Chapter 12)

Overview: The heart is a four-chambered organ, supplied by coronary circulation that pumps oxygen-poor blood to the lungs and oxygen-rich blood to the rest of the body. The blood vessels of the cardiovascular system can be subdivided into the Pulmonary circuit (which carries blood to and from the lungs) and the systemic circuit (which transports blood to and from the body). Arteries carry blood away from the heart; veins return blood to the heart. Capillaries are tiny vessels between the smallest arteries and smallest veins.

Essential Questions:

- What is the anatomy of the heart-including its surface features; the structure of the pericardium, heart wall, and cardiac skeleton?
- How does blood flow through the heart?
- What are the major blood vessels, chambers, and heart valves?
- What are the events of an action potential in cardiac muscle and describe the electrical events recorded in an electrocardiogram?
- How are heart sounds related to the events of the cardiac cycle?
- How are the factors that influence heart rate and stroke volume related to physical activity?
- What are the functional relationships between the human cardiovascular system and other human systems?
- How does a failure of homeostatic mechanisms in the human blood lead to disease?

NYSSLS Standards:

- **HS-LS1-1 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.**
 - (DCI) **LS1.A: Structure and Function:** Systems of specialized cells within organisms help them perform the essential functions of life
 - (CCC) **Structure and Function:** 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.
 - (SEP) **Constructing Explanations and Designing Solutions:** Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, 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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
 - (DCI) **LS1.A: Structure and Function:** 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.
 - (CCC) **Systems and System Models:** Models (e.g. physical, mathematical, computer models) can be used to simulate systems and interactions -- including energy, matter, and informational flows -- within and between systems at different scales.
 - (SEP) **Developing and Using Models:** Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. Use a model based on evidence to illustrate the relationships between systems or between components of a system.
- **HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis**
 - (DCI) **LS1.A: Structure and Function:** 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.
 - (CCC) **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
 - (SEP) **Planning and Carrying Out Investigations:** 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



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3D Learning Overview:		Crosscutting Concepts (CCC):		Science and Engineering Practices (SEP):	
<p>KNOW → <u>Disciplinary Core Ideas (DCI)</u>: what students need to know</p> <p>UNDERSTAND → <u>Crosscutting Concepts (CCC)</u>: what students look for/ applies across all science domains and <u>Science & Engineering Practices (SEP)</u>: how students explore and apply</p>		<ul style="list-style-type: none"> ● Patterns ● Cause and Effect ● Scale, Proportion, and Quantity ● Systems and System Models ● Energy and Matter ● Structure and Function ● Stability and Change 		<ul style="list-style-type: none"> ● Asking questions (for science) and defining problems (for engineering) ● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations (for science) and designing solutions (for engineering) ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information 	
Time Frame	Skills, Practices or Expectations	Textbook Resources	Online Resources	Vocabulary	Higher Order Questions
<p style="text-align: center;">2.14.22 - 3.4.22</p> <p style="text-align: center;">NOTE: Mid-Winter Recess 2.21.22 – 2.25.22</p>	<p>Anatomy and Physiology: The students will be able to:</p> <ul style="list-style-type: none"> ● Describe the anatomy and physiology of the human heart. ● Trace the flow of blood through the human heart ● Interpret the electrical events associated with an electrocardiogram ● Describe a disease/disorder of the human heart ● Describe the functional relationships between the human cardiovascular system and other human body systems <p>Diseases/Disorders: The students will be able to:</p> <ul style="list-style-type: none"> ● Explain the effects of lack of exercise on the human muscular system as it relates to their heart. ● Describe a disease or disorder of the human cardiovascular system including symptoms, diagnosis, medications, prevention, treatment. ● Diagnose a human cardiovascular system disease/disorder given a data set of symptoms. 	<p>Chapter 12</p> <p>The Heart’s Role in the Cardiovascular System (p.406)</p> <ul style="list-style-type: none"> ● Figure 12-1 Cardiovascular System Overview (p.406) <p>12-1 The Heart (p.407-415)</p> <ul style="list-style-type: none"> ● Figure 12-2 Location of Heart in Thoracic Cavity (p.407) ● Figure 12-3 Surface Anatomy of the Heart (p.408) ● Figure 12-4 Heart Wall Layers (p.410) ● Figure 12-5 Cross Section Anatomy of Heart (p.411) ● Figure 12-6 Heart Valves (p.413) <p>12-2 Contractile Cells and EKG (p.415-419)</p> <ul style="list-style-type: none"> ● Figure 12-9 Conducting System of Heart (p.417) ● Figure 12-10 An EKG (p.419) <p>12-3 Cardiac Cycle (p.419-421)</p> <ul style="list-style-type: none"> ● Figure 12-11 Cardiac Cycle (p.420) 	<p>Michigan State Histology Slides:</p> <ul style="list-style-type: none"> ● Cardiovascular System <p>HASPI:</p> <ul style="list-style-type: none"> ● Cardiovascular System - use charts to learn about blood vessels, the heart, blood pressure, pulse, histology, disease and hematocrits <p>HHMI:</p> <ul style="list-style-type: none"> ● Cardiology Lab - virtually examine patients with heart issues (self-checking quizzes along the way) <p>UB Case Studies:</p> <ul style="list-style-type: none"> ● Anyone Who Had a Heart - learn about adult and fetal heart structure, treatment for heart defects and the signs of poor blood flow ● Cardiac Blood Flow - review blood flow in the heart, parts of the heart and how valves play a role 	<p>systole/ diastole atrium/ ventricle septum cardiac cycle cardiac output intercalated disc electrocardiogram (ECG/ EKG) pericardium <u>Layers of Heart:</u> epicardium, myocardium, endocardium <u>Valves of Heart:</u> atrioventricular valves (bicuspid (mitral), tricuspid), semilunar valves (aortic, pulmonary) <u>Parts of Electrical Event:</u> sinoatrial node, atrioventricular node, bundle of his, Purkinje fibers</p> <p>homeostasis/ homeostatic regulation disease/ disorder symptoms negative feedback loop positive feedback loop</p>	<ul style="list-style-type: none"> ● Describe the relationships of the four chambers of the heart to the pulmonary and systemic circuits. ● What are the sources and clinical significance of the heart sounds? ● A newborn needs surgery because they were born with an aorta that arises from the right ventricle and a pulmonary trunk that issues from the left ventricle, a condition called transposition of the great vessels. What are the physiological consequences of this defect? ● A patient's EKG tracing shows a consistent pattern of two P waves followed by a normal QRS complex and T wave. What is the cause of this abnormal pattern? ● The following measurements were made on two individuals (the values recorded remained stable for 1 hour): Patient A: heart rate, 75 bpm; stroke volume, 60 mL Patient B: heart rate, 90 bpm; stroke volume, 95 mL



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	<ul style="list-style-type: none"> Explain homeostasis in the human cardiovascular system through negative and positive feedback mechanisms. Predict prevention and treatment of a human cardiovascular system disorder based on a given data set. 	<p>12-4 Cardiac Output (p.421)</p> <p>Chapter 12 Review Questions (p.426-427)</p>	<p>PBS Sheep Heart Dissection Videos</p> <p>ECG Simulator (click on types of heart problems to read a description and see and hear the ECG)</p> <p>The Heart Basics (PBS Learning Media video)</p>		<p>Which person has the greater venous return? Which person has the longer ventricular filling time?</p>
<p>http://ngss.nsta.org/Classroom-Resources.aspx - Searchable NYSSLS/NGSS aligned resources curated by NSTA</p> <p>Dissection Videos (these videos -- dissection of heart, liver, uterus and eye -- were created in collaboration with the Jacobs School of Medicine and Biomedical Sciences. All dissection videos have two separate segments - an introduction segment and a dissection segment. All segments have an accompanied student activity resource)</p> <p>Access via Schoology→BPS Science K-12 Group→Resources→9-12 Resources→Anatomy & Physiology→Dissection Videos</p> <p>Virtual Frog Dissection (step by step virtual dissection)</p> <p>PBS Learning Media Dissection Videos and Resources (Sheep Heart, Cow Eye, Frog)</p> <p>Virtual Fetal Pig Dissection (from Whitman College)</p> <p>Cow Eye Dissection (video, step-by-step virtual dissection, PDF of student lab guide)</p> <p>NYSED Bilingual Glossaries – NY Statewide Language Regional Bilingual Education Resource for NYSED approved bilingual glossaries.</p>					
<p>English Language Learners (ELL) Enhancements</p> <p>To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p>Listening</p> <ul style="list-style-type: none"> Cross- Linguistic Practices: Gives students opportunities to make connections between what they hear and their home language (ex: allow students to listen to a passage and identify cognates.) Build background knowledge Activating Prior Knowledge Activating Prior Knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content Visuals - GIFs, pictures- assist students in understanding. Use visual thinking strategies to set learning lens Video to review/ introduce topics– use closed captioning to help students see the words and pronunciations while they listen Word stretching / Vowel stretching when instructing allows student to listen closely to the pronunciation of the word 	<p>Speaking</p> <ul style="list-style-type: none"> Sentence Frames - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> Academic Conversation Starters: Have a visual of a list of academic sentence starters that students can refer to in a discussion (helps students have a more science focused dialogue). Examples include- I expect ____ to happen. My data shows that... Choral Reading - To build fluency, self-confidence and motivation with reading/speaking Create movement to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning 	<p>Reading</p> <ul style="list-style-type: none"> Supplementary Text to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. Visual Aids - Pictures or models to support vocabulary words and concepts Video to review or introduce a topic - use closed captioning to help students read along while they listen to the content 4 Square / Frayer models to help students gain a deeper understanding of vocabulary. Highlighting important text to assist students in answering questions after the reading. Chunking-Break reading of text into chunks or paragraphs Performance Level Descriptors - description of expected output from students based on earned NYSESLAT levels in the modality of reading(Scroll for grades 9-12) Vocabulary Morphology- Morphology relates to the segmenting of words into affixes (prefixes and 	<p>Writing</p> <ul style="list-style-type: none"> Sentence Frames - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> Cloze passages with word banks Word banks Graphic Organizers to help break down the writing process and organize thoughts Standards-based sentence stems Performance Level Descriptors - description of expected output from students based on earned NYSESLAT levels in the 	



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	<ul style="list-style-type: none"> ● Performance Level Descriptors - description of expected output from students based on earned NYSESLAT levels in the modality of listening (Scroll for grades 9-12) 	<ul style="list-style-type: none"> ● Performance Level Descriptors - description of expected output from students based on earned NYSESLAT levels in the modality of speaking(Scroll for grades 9-12) 	suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary.	modality of writing(Scroll for grades 9-12)
<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP) or 504 Plan</p>	<p>Instructional</p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Anatomy concepts 	<p>Technology:</p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Anatomy concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in discussions in Schoology or in chat on Teams <p>Other:</p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 	<p>In Class Assessments</p> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks 	
<p>Step Up to Writing</p> <p>Schoology→BPS Science K-12 Group→Resources→9-12 Resources→Anatomy & Physiology→Curriculum Materials</p>	<p>SUTW Strategies</p> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 			