

Human Anatomy & Physiology

Year At A Glance							
Semester 1				Semester 2			
Unit 1: <i>Body Organization and Nutrition</i>	Unit 2: <i>Integumentary, Skeletal, & Muscular Systems</i>	Unit 3: <i>Endocrine System & Immune System</i>	Unit 4: <i>Circulatory System & Lymphatic System</i>	Unit 5: <i>Nervous System & Respiratory System</i>	Unit 6: <i>Digestive System & Urinary System</i>	Unit 7: <i>Reproductive System</i>	Unit 8: <i>Health Science Professions</i>
HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-LS1-1AR HAP-LS2-1AR HAP-LS3-1AR HAP-LS4-1AR HAP-LS5-1AR HAP-LS6-1AR HAP-LS7-1AR HAP-LS8-1AR HAP-LS8-2AR HAP-LS8-3AR	HAP-8-1AR HAP-8-2AR HAP-8-3AR
6 weeks	6 weeks	3 weeks	6 weeks	4 weeks	5 weeks	3 weeks	3 weeks

Human Anatomy and Physiology Curriculum Guide

Unit 1: Body Organization and Nutrition

Enduring Understanding(s):

- Systems of specialized cells within organisms help them perform the essential functions of life
- Anatomy is the knowledge of the different structures in the body and physiology is the understanding of how those different parts work together in harmony to maintain homeostasis.
- All of the organ systems work together to maintain homeostasis.
- The body is divided into cavities, regions and directions. Cavities are spaces in the body in which organs, tissues, and other structures reside. Regions are subdivisions of those cavities that further separate the organs of the body into systems and locations.
- Plants and animals contain mainly water and organic compounds.
- Organic Compounds are molecules made by living organisms such as plants or animals.
- Most of the organic compounds found in living organisms are lipids, carbohydrates, proteins or nucleic acids.
- Different types of food have different proportions of the different types of organic compounds.
- Indicators can be used to determine what types of organic compounds are in a sample.
- Many large organic compounds are made of multiple repeats of smaller building block compounds
- Large organic compounds are polymers made up of monomers.
- Vitamin E inhibits the cell aging due to the oxidation of phospholipid and glycolipid molecules in the membrane.

Essential Questions(s):

1. How is the body organized?
2. How do the structures that comprise each system enable the human body to function?
3. How can data be used to support explanations of body functions?
4. Define anatomy and physiology. How are anatomy and physiology related and how are they separate as branches of science?
5. How is anatomical vocabulary used to describe locations of organs, direction on the body, as well as body regions and planes of dissection?
6. How does each body system work to maintain homeostasis (life) in the human body?
7. How do positive and negative feedback models control various conditions in the body necessary for life?
8. How do Biological Organisms use energy?
9. What types of food contain starch and protein?
10. How does Vitamin E inhibit the oxidation of phospholipid and glycolipid molecules in cell membranes?

11. Why do we age? How is aging an oxidation-reduction reaction?

Time Frame/Concepts & Content: 6 weeks

Topic 1: Anatomy and Physiology

Topic 2: Body Systems

Topic 3: Language of Anatomy

Topic 4: The Chemical Basis of Life

Topic 5: Homeostasis and Feedback

Topic 6: Tissues

Topic 7: Anatomy and Physiology of Cells

Topic 8: Nutrition and Metabolism

Student Learning Expectations

Students will be able to:

- Identify basic levels of organization of the human body
- Identify body planes, directional terms, cavities and quadrants
- Identify the function, location, and organs involved in each body system
- Plan and conduct an investigation on how the body maintains homeostasis
- Analyze basic structures and functions of human body systems
- Develop and use a model to illustrate the hierarchical organization of interacting systems
- Analyze the graphs of data sets measuring different readings from a body
- Test for different types of organic compounds using chemical indicators
- Design their own investigation to identify chemical unknowns
- Compare different types of carbohydrates
- Describe Enzyme specificity
- Interpret data from experiments

Standard(s):

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HAP-LS5-1AR: Argue from evidence that cause(s) for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body

Central High School

systems and their associated processes.

Key Terminology/Vocabulary:

Dorsal Lateral Proximal Distal Superior Inferior Anatomy Physiology Histology Posterior Medial Superficial Deep Axial Appendicular Sagittal Nucleic Acid Fluid Mosaic Model	Pathology Complementary Tissues Homeostasis Positive Feedback Negative Feedback Anterior Transverse Frontal Coronal Thoracic Plueral Abdominal Mediastinum Oxidation Phospholipid Glycolipid Cell Membrane	Nutrients Vitamins Minerals Calorie Carbohydrates Proteins Fats Water Fat Soluble Water Soluble Functions Metabolic Rate Caloric Values Daily Intake Macromolecule Triglycerides Glucose Starch
--	---	--

Activities & Assessments:

Anatomy & Physiology Case Studies
Body System Chart
Simon Says
Homeostatic Graph Analysis
Macromolecule Mystery Lab
Staying Young with Vitamin E Lab
Macromolecules Jeopardy

Central High School

Functions of Proteins and DNA

Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map

Materials and Resources

Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, Science-Consortium, [Discovery Channel](#) Interactive Science Journal for students, Science News, [Kahoots](#), [QRC Codes](#) Edpuzzle.com, [On-line Virtual Labs](#), [PHet](#), [The Physics classroom.com](#), Labster, [chemcollective.org](#), [openstax.org](#), [Periodic Table](#), [Khan Academy](#), Apex, Edgenuity

Unit 2: Integumentary, Skeletal & Muscular Systems

Enduring Understanding(s):

- The relationship of bones to each other and to other body structures provides a basis for understanding the function of other organ systems.
- Epithelial tissue lines surfaces in or on the body.
- Connective tissue (CT) is divided into proper, supportive, and fluid.
- Connective tissue can be loose or dense, regular or irregular.
- The function of connective tissue proper is to connect structures together and fill spaces between structures.
- Supportive connective tissue is bone and cartilage and functions to hold the body upright and protect internal organs.
- Fluid connective tissue includes blood and lymph which serves as a highway to transport substances in the body.
- Skeletal muscle is used to move the body and is attached to bones or other muscles. It is voluntarily controlled.
- Smooth muscle lines tubes and hollow organs and is not under our voluntary control.
- Cardiac muscle makes up the bulk of the heart. It is not voluntary and serves to pump blood into vessels.
- Neural tissue sends signals with an electrochemical impulse. This impulse is used to cause immediate change in an organ or tissue.
- Bones are classified as either long, short, irregular or flat.
- The axial skeleton is the trunk of our body, the main purpose for this skeleton system is to protect the underlying organs of the head, abdomen, and thorax.
- There are 206 bones in the body with 83 unique names.

Essential Question(s):

1. How does the structure of an epithelium fit its function?
2. How is connective tissue categorized and what is the function of each category of CT?
3. How does muscle tissue vary by location and function?
4. How does nervous tissue serve as the fast-acting control center of the body?
5. How do the axial and appendicular skeletons have similarities and differences? How do these similarities and differences allow them to perform the functions required of the skeletal system?
6. How are bones classified and how are the structures of these bones similar and different?
7. How are the bones in our body named, oriented, and located?
8. Why are there so many different ways that someone can fracture a bone?

Time Frame/Concepts & Content: 6 weeks

Topic 1: Skin and Its Appendages

Topic 2: Skeletal Tissues

Topic 3: Skeletal System

Topic 4: Articulations

Topic 5: Anatomy of the Muscular System

Topic 6: Physiology of the Muscular System

Student Learning Expectations:

Students will be able to:

- Identify the four major classifications of tissues of tissues and their subsequent divisions.
- Identify the basic levels of human body organization.
- Analyze basic structures and functions of human body systems.
- Illustrate the hierarchical organization of interacting systems.
- Identify the different bones based upon the variety of markings and shapes of the bones.
- Describe the structure, classification, and functionality of the different types of bones in the body.
- Analyze skeletal and muscular structures and functions

Standard(s):

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

Central High School

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Red Marrow	Zygomatic	Pubis	Hair
Yellow Marrow	Maxilla	Ilium	Nails
Hematopoiesis	Mandible	Ischium	Muscle movement
Long Bone	Vomer	Ulna	Muscle contraction
Short Bone	Conchae	Radius	Joints
Flat Bone	Fontanel	Pollex	Appendicular Skeleton
Irregular Bone	Suture	Hallus	Bone structure
Foramen	Lambdoidal Suture	Phalanges	Ball-and-socket joints
Fossa	Sinus	Patella	Gliding Joint
Compact	Hyoid	Calcaneus	Hinge Joint
Spongy	Dumb Bone	Talus	Pivot Joint
Trabeculae	Vertebrae	Tarsal	Saddle Joint
Axial	Cervical	Metatarsal	Spine
Appendicular	Thoracic	Carpals	Ribs
Cranium	Lumbar	Metacarpals	Skull
Parietal	Femur	Lordosis	Peiosteum
Temporal	Tibia	Scholosios	Haversian canals
Occipital	Fibula	Tendon	Osteocytes
Frontal	Scapula	Skeletal	Shoulder
Sphenoid	Clavicle	Ligament	Pelvis
Ethmoid	Digits	Skin	Flexor
Humerus	Sternum	Regulate Temperature	Extensor
Sarcomere	Z-lines	Actin	Myofibri

Activities & Assessments:

Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map

Materials and Resources:

Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, [Discovery Channel](#), Interactive Science Journal for students, Science News, [Kahoots](#), [QRC Codes](#), Edpuzzle.com, [On-line Virtual Labs](#), [PHet](#), [The Physics classroom.com](#), Labster, [chemcollective.org](#), [openstax.org](#), [Periodic Table](#), [Khan Academy](#), Apex, Edgenuity

Unit 3: Endocrine System & Immune System

Enduring Understanding(s):

- The Endocrine System uses feedback mechanisms to maintain homeostasis.
- The pancreas in the human body regulates blood sugar.
- The feedback mechanisms detect the amount of hormones in the bloodstream.
- Glucose is stored in the liver.

Essential Question(s):

1. How do feedback mechanisms adjust the production or release of hormones?
2. How does the human body maintain hormone levels in the bloodstream?
3. What is released after your blood sugar level is too high?
4. Which organ is essential to the Endocrine system?
5. How do you determine whether to use a positive or negative feedback mechanism?

Time Frame/Concepts & Content: 3 weeks

Topic 1: Endocrine System

Topic 2: Immune Response

Topic 3: Metabolism

Topic 4: Heredity

Topic 5: Understanding virus and cancer

Student Learning Expectations:

Students will be able to:

- Name, with detail, organ systems and their organs.
- Describe the organ's main function.
- Explain how the organs work with other systems to keep the body healthy.
- Analyze which diseases or disorders affect the organs.
- Determine body organ needs.

Central High School

- Model how the Endocrine System uses feedback mechanisms.
- Differentiate between positive and negative feedback loops.
- Describe how feedback mechanisms help to maintain homeostasis.

Standard(s):

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Nonspecific Immunity Physical Barrier Chemical Barrier Phagocytosis Inflammation Fever Interferon White Blood Cells	Mucous Membranes Lysozyme Lactic Acid Hydrochloric Acid Spermine Phagocyte Bacterium Lysosome	Endocrine Glands Pancreas Homeostasis Hormones Adrenal Hypothalamus Parathyroid Pineal	Amino Acids Steroid Hormones Thyroid Hormones Receptor Proteins Ovary Testis Islets of Langerhans Insulin
--	--	---	--

Central High School

Specific Immunity Antigens Humoral Immunity Cell Mediated Immunity Antibody B-Cells Barrier	Egestion Histamine Pyrogens Neutrophils Macrophages Viral Inhibition Inhibition	Pituitary Thymus Thyroid Neutralization Agglutination Helper T cells Interleukin	Glucogen Negative Feedback Mechanism Positive Feedback Loops B-Lymphocytes T-Lymphocytes Cytotoxic T cells
Activities & Assessments:			
How HIV infects cells, Using Blood Tests to Identify Babies and Criminals, Human Body Wanted Poster, Immune Response Activity, Understanding Cancer, Spread of an Infectious Disease, Feedback Mechanism Lab Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map			
Materials and Resources:			
Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, Discovery Channel , Interactive Science Journal for students, Science News, Kahoots , QRC Codes , Edpuzzle.com, On-line Virtual Labs , PHet , The Physics classroom.com , Labster, chemcollective.org , openstax.org , Periodic Table , Khan Academy , Apex, Edgenuity			

Unit 4: Circulatory System & Lymphatic System

Enduring Understanding(s):

- A blood type or blood group is a classification of blood based on antigens on the surface of red blood cells.
- There are two major blood type systems: ABO and Rhesus.
- Blood is composed of plasma and formed elements.
- Blood has three main functions: Regulatory, Protective and Distributive
- Blood disorders are caused because one of the formed elements are not functioning properly as a result of genetic mutation.
- New blood cells are created when a hormone called erythropoetin (EPO) is released by the kidney.
- Atria are the receiving chambers of the heart and ventricles expel blood from the heart.
- The systematic pathway sends oxygen rich blood to the entire body and back to the heart.
- The pulmonary pathway is necessary to take oxygen depleted blood to the lungs and back.
- Build up of fatty plaques on artery walls can cause the delicate endothelium to rupture.

Essential Question(s):

1. What are the composition and components found in the blood? Why is it necessary for each of the components to exist in order for blood to be functional?
2. How do the components of blood provide functionality?
3. How are blood disorders caused and what is happening on a cellular level to initiate those disorders?
4. How are new blood cells created and how does the body know when it is appropriate to create more blood cells and/or destroy old ones?
5. What are the different blood types and why is it critical to understand how those blood types function in regards to organ transplants and/or giving or receiving blood donations?
6. How does exercise affect the heart rate?
7. What are the independent, dependent and control variables?
8. How does Heart rate impact homeostasis?
9. Why is blood type in some people negative and some is positive?
10. How does blood pressure impact the functioning of the heart?
11. How do atria and ventricles differ in function and what are the major chambers and valves in the heart?
12. Why are there two pathways of blood flow out of the heart and to where do they travel?
13. How does the electric impulse generated at the sinoatrial node travel through the rest of the heart?

14. How does atherosclerosis lead to heart attacks?

Time Frame/Concepts & Content: 6 weeks

Topic 1: Composition of Blood
Topic 2: Function of Blood
Topic 3: Blood Disorders
Topic 4: Parts of the Heart (Cardiovascular System)
Topic 5: Pathway of Blood
Topic 6: Heart Disease
Topic 7: Comparative Anatomy
Topic 8: Lymphatic System

Student Learning Expectations:

Students will be able to:

- Create, design, and conduct their own lab experiment.
- Create a data table for experimental data.
- Write a conclusion that focuses on evidence from their designed experiment.
- Apply the concepts of the scientific method.
- Compare the anatomy of an animal to the anatomy of a human.
- Illustrate the hierarchical organization of interacting systems.
- Complete a Punnett Square for a single trait.
- Predict the blood type that is inherited.
- Explain how the immune system affects blood transfusions.
- Explain the variation and distribution of expressed traits in a population
- Analyze the components of blood.
- Create a model of the electrical pathway of blood.
- Research a heart condition and present the disease.
- Discuss environmental factors and genetic conditions that cause heart disease.

Standard(s):

Central High School

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Heart Blood Vessels Blood Blood Type Transport Materials Left Atrium Left Ventricle Aorta Coronary Arteries Vena Cava Right Atrium Right Ventricle Donor Receptor	Plasma Hemoglobin Red Blood Cells White Blood Cells Platelets A, B, AB, O, Rh factor Blood pressure Hormones Food nutrients Arteries Capillaries Veins Carotid Artery Genotype Phenotype	Tonsils Thymus Capillaries Fluid Loss Recycle Lymph Nodes Lymphatic Vessels Bone Marrow Spleen Pulmonary Arteries Sinoatrial node Antibodies Transfusions Hematocrit	Hemoglobin Neutrophil Basophil Eosinophil Megakaryocyte Hemostasis Erythropoiesis Erythropoietin Anemia Hemorrhage Hemolytic Pernicious Sickle Cell Leukemia
--	---	---	---

Central High School

Blood Type Fibrinogen Fibrin Thrombin Embolysm Thrombus Hemophelia Antigen Antibody Agglutination Apex Fibrillation Chordae Tendinae	Leukocytes Blood doping Etiology Pathology Diagnosis Prognosis Hematopoeisis AV Node SA Node Bundle of His Purkinje Fibers	Erythrocytes Thrombocytes Paracardium Myocardium Endocardium Right Atrium Bicuspid Valve Right Ventricle Pulmonary Semilunar Valve Pulmonary Vein Left Atrium Tricuspid Valve Left Ventricle Aortic Semilunar Valve	Vascular Spasm Platelet Plug Coagulation Pulmonary Systemic Systole Diastole Arterial Capillary Coronary Artery Infarct Angeoplasty Conduction System Superior Vena Cava Inferior Vena Cava
Activities & Assessments:			
Pathway of Blood, Electrical Currents of the Heart, Blood Pressure Lab, Heart Disease Presentation, Conduction Review Game, Hand Puppets of the Heart, Composition of Blood Virtual Lab, Blood Function Analogies, Hematopoeisis Dance, Blood Typing Lab, Heart Rate Lab, Comparative Anatomy Project, ABO Blood Type Activity, Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map			
Materials and Resources:			
Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, Discovery Channel , Interactive Science Journal for students, Science News, Kahoots , QRC Codes , Edpuzzle.com, On-line Virtual Labs , PHet , The Physics classroom.com , Labster, chemcollective.org , openstax.org , Periodic Table , Khan Academy , Apex, Edgenuity			

Unit 5: Nervous System & Respiratory System

Enduring Understanding(s):

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional.
- Feedback mechanisms can encourage or discourage what is going on inside the living system.
- There is a relationship between systems or between components of the system.
- Negative feedback occurs when a change in a regulated variable triggers a response which reverses the initial change and brings the regulated variable back to the set point.
- Positive feedback occurs when a change in a variable triggers a response which causes more change in the same direction.
- Cells carry out cellular respiration to make ATP; it requires oxygen and carbon dioxide.
- The respiratory system and circulatory system work together to bring oxygen to cells all over the body and get rid of carbon dioxide.
- Your body temperature depends on the balance between the amount of heat generated by your body's metabolism and the amount of heat lost to or gained from the environment.
- Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.

Essential Question(s):

What are the effects of temperature on the structure and function of molecules?
How does physical activity result in the production of heat?
Energy conversion results in the production of heat. Is it considered efficient or inefficient?
During cellular respiration, what percent of energy is transferred to ATP and what percent is converted?
How does a person develop heat exhaustion?
How does heat exhaustion lead to heat stroke?
What does human temperature regulation depend on?
What role does the hypothalamus play in sensor response?
Why should you drink more water if you are exercising in a hot environment?

Time Frame/Concepts & Content: 6 weeks

Topic 1: Central Nervous System
Topic 2: Peripheral Nervous System

Topic 3: Sense Organs

Topic 4: Anatomy of the Respiratory System

Topic 5: Physiology of the Respiratory System

Student Learning Expectations:

Students will be able to:

- Develop an understanding of homeostasis, negative feedback and positive feedback
- Describe cellular respiration
- Observe changes in breathing
- Design a relevant investigation and interpret the results
- Compare changes in rate vs. depth of breathing
- Discuss the effects of Carbon Dioxide and Oxygen
- Provide evidence that feedback mechanisms maintain homeostasis
- Compare set point temperature to the actual body temperature
- Develop, revise, and use a model to illustrate and predict the relationships between systems and components of systems
- Apply scientific ideas, principles and evidence to provide an explanation of phenomena.

Standard(s):

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a

Central High School

range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Neuron Action Potential Neurotransmitters Neuron Types Central Nervous System Brain Cerebral Cortex Limbic System Lower Brain Stem Peripheral Nervous System Sensory Receptors Nerve Nucleus Cell Body Dendrites Axon Myelin Sheath Nodes of Ranvier Axon Terminals Membrane potential Sodium Potassium pumps K ⁺ , Na ⁺ Nerve Impulse Chemoreceptors Mechanoreceptors Pain Receptors Photoreceptors	Synapse Presynaptic Neuron Postsynaptic Neuron Sensory Neurons Motor Neurons Interneurons Spinal cord Corpus Callosum Cerebral Cortex Outer Cerebrum Processing Senses Gray matter Inner Cerebrum Cerebellum Thalamus Hypothalamus Emotions Memory Midbrain Pons Medulla Oblongata Cranial Nerves Spinal Nerves Ganglia Somatic Nervous System Autonomic Nervous System Thermnoreceptors	Lungs Bronchioles Alveoli Diaphragm Air flow Nose Pharynx Larynx Trachea Bronchi Air Transport Oxygen Carbon Dioxide Diffusion Hydrochloric Acid Cellular Respiration Equilibrium Balance Components Internal conditions Stability ATP Diffusion Oxidation Exhaustion Pressure
--	--	---

Activities & Assessments:

Breathing and Holding Your Breath, Homeostasis and Negative Feedback, Investigating Changes in Breathing, Improving Experimental Design, Changes in Blood Levels, Heart Disease Presentation, Conduction Review Game, Hand Puppets of the Heart, Composition of Blood Virtual Lab, Blood Function Analogies, Hematopoiesis Dance, Blood Typing Lab Heart Rate Lab, Comparative Anatomy Project, ABO Blood Type Activity, Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map

Materials and Resources:

Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, [Discovery Channel](#), Interactive Science Journal for students, Science News, [Kahoots](#), [QRC Codes](#), Edpuzzle.com, [On-line Virtual Labs](#), [PHet](#), [The Physics classroom.com](#), Labster, [chemcollective.org](#), [openstax.org](#), [Periodic Table](#), [Khan Academy](#), Apex, Edgenuity

Unit 6: Digestive System and Urinary System

Enduring Understanding(s):

- Accessory organs secrete substances that aid in digestion.
- The organs of the alimentary canal form a continuous pathway for food to travel through the body.
- Carbohydrates begin digestion in the mouth when the salivary glands secrete the enzyme amylase.
- In the stomach, enzymes and HCl begin the digestion of protein.
- The pancreas secretes all categories of enzymes necessary to break down the four macromolecules.
- Bile from the liver is required to emulsify fat.
- Gastric pits in the stomach contain cells that secrete HCl, pepsinogen, mucus, and hormones that control digestion.
- Villi in the small intestine are lined with columnar cells that contain microvilli at their surface to maximize surface area for absorption.
- Kidneys are the principal organs of the urinary system. The chief function of the kidneys is to process blood and form urine.
- Urinary system regulates the content of blood plasma
- Basic functional unit of the kidney is the nephron; forms urine through three processes.

Essential Question(s):

1. How do accessory organs differ from organs making up the alimentary canal?
2. How does each organ contribute to the digestion of the four major categories of biological macromolecules?
3. How is the digestive system specialized at the microscopic level to aid in breaking down and absorbing food?
4. How does the mechanism for voiding urine start?
5. How is effective filtration pressure calculated?
6. What would happen if the nerves supplying the bladder and urethra were damaged?
7. What is the relationship between age and kidney function?
8. What gives urine its characteristic yellowish color?

Time Frame/Concepts & Content: 5 weeks

Topic 1: Anatomy of the Digestive System
Topic 2: Physiology of the Digestive System
Topic 3: Anatomy & Physiology of the Urinary System
Topic 4: Microscopic Structure of the Nephron

Central High School

Topic 5: Fluid and Electrolyte Balance

Topic 6: Acid-Base Balance

Student Learning Expectations:

Students will be able to:

- Track what happens to food as they eat it by exploring the alimentary canal of the digestive system.
- Compare accessory structures to alimentary structures.
- Describe the digestion macromolecules.
- Discuss the hormones that control appetite and how they link to homeostatic control of the body's need for nutrients.
- Create their own illustration of a villus with columnar cells that have microvilli.
- Describe the characteristics of urine (normal and abnormal).
- Summarize the nephron function
- Identify the beginnings of the "plumbing system" of the urinary system.
- Diagram the flow of blood through the kidneys.

Standard(s):

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

<p>Alimentary Mouth Pharynx Esophagus Stomach Duodenum Jejunum Ileum Colon Cecum Appendix Rectum Anus Sphincter Gallbladder Emulsify Lipase Kidneys Loop of Henle Macula Densa Mesangial Cells Myogenic Mechanism Nephrons Nitrogenous wastes Peritubular Capillaries Pigments Reabsorption Renal Clearance Renal Columns Renal Corpuscle</p>	<p>Salivary Glands Liver Pancreas Ingestion Propulsion Peristalsis Mechanical Digestion Chemical Digestion Mucosa Submucosa Muscularis Externa Serosa Mesentery Peritoneum Bolus Hepatopancreatic Sphincter Cirrhosis Renal Medulla Renal Pelvis Renal Pyramids Sodium Cotransport Toxins Tubular Secretion Tubuloglomerular Feedback Ureters Urethra Anuria Biopsy Dysuria Glomerulonephritis</p>	<p>Chyme Frenulum Ankyloglossia Amylase Segmentation Gastroesophageal Sphincter Pepsin Intrinsic Factor Pylorus Omentum Rugae Ulcer Villi Microvilli Lacteal Bile Jaundice Hematuria Hemodialysis Hydronephrosis Hypertension Interstitial Cystitis Nephritis Nephrotic Syndrome Uremia Uremic Syndrome Urethritis Renal Failure Renal Ptosis Pyuria</p>
---	--	--

Central High School

Renal Cortex	Glycosuria	Filtration
Activities & Assessments:		
Trash Bag Illustration, Food Day Essay, Hormone Research, Poser Project, Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map		
Materials and Resources:		
Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, Discovery Channel , Interactive Science Journal for students, Science News, Kahoots , QRC Codes , Edpuzzle.com, On-line Virtual Labs , PHet , The Physics classroom.com , Labster, chemcollective.org , openstax.org , Periodic Table , Khan Academy , Apex, Edgenuity		

Unit 7: Reproductive System
Enduring Understanding(s):
<p>When a fetus is 8 weeks old, the chromosomes activate a different pathway depending on whether there are two copies of the X chromosome, or only one.</p> <p>Female reproductivity anatomy differs from the males in regards to functionality.</p> <p>The purpose of the male reproductive anatomy is to be able to deliver sperm.</p> <p>The female anatomy must be able to not only receive sperm, but also to be able to house, nurture and ultimately deliver a baby during the 9 months of pregnancy.</p> <p>A female's body changes in a multitude of ways during a pregnancy.</p>
Essential Question(s):
<p>How does a fetus differentiate into either a male or female by the time it is born?</p> <p>How is the female reproductive anatomy different from the male reproductive anatomy?</p> <p>How does a pregnancy impact the overall anatomy and physiology of the female body?</p>
Time Frame/Concepts & Content: 3 weeks
<p>Topic 1: Fetal development</p> <p>Topic 2: Male and Female Reproductive Anatomy</p> <p>Topic 3: Changes during pregnancy</p>
Student Learning Expectations:
<p>Students will be able to:</p> <p>Create a step by step map with instructions on the path that the sperm takes from the creation of the sperm to fertilization of the egg.</p> <p>Interview a "Mom-to-Be" to assess noticeable changes.</p> <p>Dissect a pregnant cat.</p> <p>Dissect a fetal pig.</p> <p>Describe how the structure of DNA determines the structure of proteins.</p> <p>Discuss what would happen to one body system if the another body system fails.</p>

Explain how the body keeps you alive when there are changes in the environment.

Standard(s):

HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Sperm
Ovum
Ovulation
Menstruation
Penis
Vagina
Ovaries
Testes
Prostate
Vas Deferens

Uterus
Epididymis
Vulva
Labia Minora
Labia Majora
Seminal Gland
Bulbourethral Gland
Clitoris
Endometrium
Cervix

Central High School

Fallopian Tubes Hormones Urethra Prostate Estrogen Lining of the Uterus Cleavage Blastocyst Implantation Umbilical Cord	Fimbria Semen Seminiferous Tubules Follicle-stimulating Luteinizing Progesterone Luteal phase Embryo Placenta Fetus
Activities & Assessments:	
Human Body Disorder Lab, Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map	
Materials and Resources:	
Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, Discovery Channel , Interactive Science Journal for students, Science News, Kahoots , QRC Codes Edpuzzle.com, On-line Virtual Labs , PHet , The Physics classroom.com , Labster, chemcollective.org , openstax.org , Periodic Table , Khan Academy , Apex, Edgenuity	

Unit 8: Health Science Professions	
Enduring Understanding(s):	
Trends in healthcare professions include breakthroughs in prevention or treatment of a disease, specific health professions or new advances in technology.	
Essential Question(s):	
<p>What name is given to a high school class that explores medical terminology, anatomy, and various health professions?</p> <p>What health profession combines biology and medicine with engineering?</p> <p>What activity is designed to give students an up-close look at the working world, which involves following a professional through a normal day on the job?</p> <p>The MCAT is an exam required for entrance into medical school. What does MCAT stand for?</p> <p>What is the largest healthcare occupation?</p>	
Time Frame/Concepts & Content: 3 weeks	
<p>Topic 1: Foundations of Medicine and Health Science</p> <p>Topic 2: Structures and Functions of the Human Body</p> <p>Topic 3: Medical Science with Clinical Applications</p>	
Student Learning Expectations:	
<p><i>Students will:</i></p> <ul style="list-style-type: none"> • Learn more about the history and current trends of health professions. • Research potential health careers and professions. • Set up a nutrition plan as if they are a nutritionist or dietitian. • Identify professions in health. • Identify characteristics of effective providers of healthcare. 	
Standard(s):	
HAP-LS1-1AR: Construct an explanation based on evidence obtained from a variety of sources for the pattern of hierarchical organization of	

Central High School

each body system

HAP-LS2-1AR: Develop and use a model to identify and describe the relationship between the structures and physiological processes of each body system

HAP-LS3-1AR: Use mathematics and computational thinking to support explanations for physiological processes in body systems

HAP-LS4-1AR: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis

HAP-LS5-1AR: Argue from evidence the causes for a dysfunction in a body system and the mechanisms by which it occurred.

HAP-LS6-1AR: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy among body systems and their associated processes.

HAP-LS7-1AR: Develop and use a model to illustrate the interactions between systems that control or affect specific functions within the human body.

HAP-LS8-1AR: Obtain, evaluate, and communicate information related to health science professions.

HAP-LS8-2AR: Design a solution to a complex real-world problem affecting body systems that can be solved through engineering.

HAP-LS8-3AR: Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural and environmental impacts.

Key Terminology/Vocabulary:

Careers
Professions

Activities & Assessments:

Human Body Disorder Lab, Kahoot, Connective Tissue Concept Mapping, Exercise Examples, Neural Tissue Homeostasis Analysis, Anatomy & Physiology Case Studies, Quick writes, Exit tickets, Lab analysis, Graphs, Data Presentations, Card Sort(Vocabulary), Digital Lab notebook, Quizlet, QRC Codes, Lesson Quiz, Scientific Investigations, Teacher/Student Models, Student Response Questions, Concept Map

Materials and Resources:

Lesson plan, Textbook, Videos, Chart paper, Paper/pencils/ pens/ coloring pencils, 3M-Young Scientist Lab, Discovery Education, Science-Consortium, [Discovery Channel](#), Interactive Science Journal for students, Science News, [Kahoots](#), [QRC Codes](#), Edpuzzle.com, [On-line Virtual Labs](#), [PHet](#), [The Physics classroom.com](#), Labster, [chemcollective.org](#), [openstax.org](#), [Periodic Table](#), [Khan Academy](#), Apex, Edgenuity