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DEPARTMENT: **Science** COURSE: **Anatomy and Physiology**

Curriculum Development Timeline

School: Ocean Township High School

Course: Anatomy and Physiology

Department: Science

Board Approval	Supervisor	Notes
July 2011	Patrick Sullivan	Born Date
December 2017	Patrick Sullivan	Update Standards
August 2018	Patrick Sullivan	Revisions
August 2019	Patrick Sullivan	Review
August 2022	Patrick Sullivan	Alignment to Standards

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Township of Ocean Pacing Guide			
Week	**Marking Period 1**	**Week**	**Marking Period 3**
1	Introduction & Anatomical Terms	11	Nervous System
2	Anatomical Terms	12	Nervous System
3	Cell Structure & Homeostasis	13	Cardiovascular System
4	Homeostasis/Drug Dosage	14	Respiratory System
5	Homeostasis/Drug Dosage	15	Respiratory System
Week	**Marking Period 2**	**Week**	**Marking Period 4**
6	Integumentary System	16	Digestive System
7	Skeletal System	17	Reproductive System & Fertility
8	Skeletal System	18	Global Health
9	Muscular System & Biomechanics	19	Pathology & Autopsy
10	Muscular System & Biomechanics	20	Body System Project

Climate Change: Respiratory System (NJSLS-S: HS-ESS3-4)

Core Instructional & Supplemental Materials including various levels of Texts

Health and Science Pipeline Initiative (HASPI) curriculum labs:
http://www.haspi.org/anatomy-and-physiology.html

Text:
Anatomy Text Shier, Butler, and Lewis (2016), Hole's Human Anatomy & Physiology. New York, NY: McGraw Hill Education.

Digital Resources Across All Levels: (D=differentiated)
BioDigital Human (D)

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Edpuzzle (D)
Gizmo (D)
OTHS Science Resource Digital Library
New York Times Articles
PhET Interactive Simulations (D)
Science News (D)
Ted Talks

Time Frame	**2 Weeks**

Topic

Introduction and Anatomical Terms

Alignment to Standards

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

Learning Objectives and Activities

Learning Objectives:

- How do professionals study and communicate about the body?
- How are medical terms created?
- How do professionals communicate about the body with patients and families?
- There are 11 major body systems, each with their own function, which all interact with and depend on each other
- There are many disorders that affect the human body caused by genetics, environment, injury, lifestyle or a combination of these

Learning Activities:

- Using anatomical language - Students will use an interactive internet resource from Wisc-Online, a digital library of web-based learning resources. Students will have the opportunity to learn and review anatomical terminology including relative positions, body sections, divisions of the abdominal pelvic cavity and regional body parts. The analysis requires students to apply what they have learned by choosing and defining terminology used in the medical field.
- Anatomical language review - Students will review the regional body parts and anatomical positions through an interactive activity that involves placing labels on a “student model”. The analysis will require students to further label diagrams with the

body regions and identify the organs in abdominal quadrants and regions. Students will also apply this knowledge to patient treatment directions.

- Medical terminology basics - Students will familiarize themselves with the basics of using medical terminology including common medical prefixes, root words and suffixes. Students will practice combining and breaking down medical terms using pre-made cards. Students can also choose to play a review game with the cards. The analysis will allow students to apply the medical terminology deciphering techniques they have learned by creating a medical story, translating a medical description and translating an emergency room report.
- Body systems poster - Students will create a life-size poster of a chosen or assigned body system. Following the poster creation, students will have the opportunity to collect basic information (function, organs, organ function and medical conditions) for each body system from posters created by classmates.

Assessments

Formative:

- Review questions in online interactive; translated paragraphs; labels on student models; terminology game participation

Summative:

- Analysis questions at the end of each lab assess understanding of term parts and how they are put together; body system posters assessed with a rubric to check for understanding of body systems integration and diseases; quiz on terminology and basic anatomy concepts (multiple choice and essay)

Benchmark:

- Content (multiple choice) assessing knowledge of body systems, anatomy terms and physiology of disease; and skills (essay) assessing ability to synthesize information from multiple units

Alternative:

- Anatomical position labels on student models; terminology game participation; body system posters creation

Interdisciplinary Connections

ELA:
WHST.9-12.9: Draw evidence from informational texts to support analysis, reflection and research. (HS-LS-1-1), (HS-LS1-6)

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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), (HS-LS1-4), (HS-LS1-5), (HS-LS1-7)
Career Readiness, Life Literacies, and Key Skills
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
Technology Integration
Career Education
CRP1: Act as a responsible and contributing citizen and employee. Students must be productive group members to create the body systems poster and work together to label a living anatomy model (partner). **CRP2:** Apply appropriate academic and technical skills. Students must use computer, research and critical thinking skills to learn and interpret medical terms. **CRP4:** Communicate clearly and effectively and with reason. The first three activities teach students how to communicate in a medical setting. **CRP6:** Demonstrate creativity and innovation. Students must find creative and attractive ways of communicating body systems information on their group posters. **CRP7:** Employ valid and reliable research strategies. Students must research the structure, function, parts and diseases for their assigned body system. **CRP11:** Use technology to enhance productivity. Students use online review tools to learn terms and positions. **CRP12:** Work productively in teams while using cultural global competence. Students must work in groups to produce an effective educational body systems poster.

Time Frame	**3 Weeks**
Topic	
Cellular Structure & Homeostasis/Drug Dosage	
Alignment to Standards	
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	

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HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
SEP-2: Developing and Using Models.

Learning Objectives and Activities

Learning Objectives:

- How does osmosis affect cell structure and function?
- Why is homeostasis important to organisms, specifically in terms of water tonicity, temperature and pH?
- How do organisms maintain homeostasis?
- Osmosis is the movement of water across a membrane from an area of high concentration to low concentration
- Osmosis is important to cells because different concentrations of solutes can cause crenation (shrinkage) or lysis (breaking) of cells
- Homeostasis is important for organisms to maintain ideal conditions for metabolic reactions

Learning Activities:

- Cell Tonicity - Students take the roll of a patient educator. A dehydrated patient is refusing the 0.9% saline IV solution and it is the student's job to explain with a visual example why it must be 0.9% saline. The students will be required to create an experiment with limited supplies. This activity focuses on osmosis as well as experimental design.
- Red Blood Cell Tonicity - Students will use animal blood purchased from a butcher source to observe the effects of tonicity on red blood cells. Red blood cells will be exposed to hypertonic, hypotonic and isotonic saline solutions. Following exposure, the red blood cell solutions will be observed with a microscope.
- Homeostasis Gizmo – Students use an online simulation to adjust the levels of clothing, perspiration and exercise to maintain a stable internal temperature as the external temperature changes. Water and blood sugar levels need to be replenished regularly and fatigue occurs with heavy exercise. Severe hypothermia, heat stroke or dehydration can result if internal stability is not maintained.
- pH of the Body - Students will test their own salivary pH over a 24-hour period. Following the 24-hour period, data will be collected for the class and a histogram created for data analysis. The importance of maintaining a healthy body pH for normal bodily functions will be discussed.
- Drug Dosage Gizmo – Students use an online simulation to explore how a drug prescription must be carefully planned to maximize benefit while avoiding an overdose. Students give a patient one or more pills and monitor the levels of

medication in the body through time. Based on the reaction of the patient, they determine the ideal levels of medication. They then create a dosage schedule so these levels are maintained through time. Four types of pills, each with a different release pattern and target organ are available for use.

Assessments

Formative:

- Experimental design when using potatoes to demonstrate tonicity, results explanation paragraph after experiment, osmosis predictions for blood cells, pH histogram evaluates graphing skills and analysis questions at the end of each lab assess student understanding of homeostasis in the body (open ended).

Summative:

- Written quiz (multiple choice and open ended) assesses student understanding of tonicity, cell function and homeostasis, and the relationship between all three.

Benchmark: N/A

Alternative:

- Experimental design when using potatoes to demonstrate tonicity, results explanation paragraph after experiment, osmosis predictions for blood cells, pH histogram evaluates graphing skills and analysis questions at the end of each lab assess student understanding of homeostasis in the body (open ended).

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements or performing technical tasks. Students must read and carefully follow directions on how to handle and observe blood, and they must write clear instructions explaining their own experimental design.

Mathematics:
MA.K-12.4: Model with mathematics. Students must use math to determine the rate of drug metabolism and the optimal drug dosage in the Gizmo simulation.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

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9.4.12.IML.8: Evaluate media sources for point of view, bias and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6).

Career Education

CRP1: Act as a responsible and contributing citizen and employee. Students must work together to design and interpret an experiment.
CRP2: Apply appropriate academic and technical skills. Students use the scientific method to design an experiment and use analysis skills to interpret results of simulations.
CRP3: Attend to personal health and financial well-being. Students measure their own body pH and analyze how their lifestyle may affect that.
CRP4: Communicate clearly and effectively and with reason. Students practice communicating the results of their experiment with a patient.
CRP6: Demonstrate creativity and innovation. Students must be creative and innovative to use limited supplies to design an experiment to demonstrate cell tonicity.
CRP11: Use technology to enhance productivity. Students use online simulations to explore homeostasis topics.

Time Frame	**1 Week**

Topic

Integumentary System

Alignment to Standards

HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
CCC-1: Patterns.

Learning Objectives and Activities

Learning Objectives:

- What is histology?
- What are the major organs and the function of the integumentary system?
- What are the causes and symptoms of skin cancer?
- Skin cancer risk factors include UV exposure and heredity; symptoms are moles that are ABCDE: **A**symmetrical, irregular **B**orders, different **C**olors, a **D**iameter greater than a pencil and **E**volving.
- The skin plays an essential role in monitoring the outside temperature, sending signals to the brain, triggering goosebumps and shivering and sweating, which helps maintain

temperature and/or water balance.

Learning Activities:

- Epithelial Tissue Histology - Students learn to identify basic epithelial tissues including simple, stratified, squamous, cuboidal, columnar, pseudostratified, transitional and keratinized. The activity is separated into three parts:
  - Part A introduces students to the function, location and structure of epithelial tissues
  - Part B is a practice activity to identify various slide images of epithelial tissues
  - Part C has students look at actual organ and tissue slides to find and identify epithelial tissues
- Integumentary System - Station lab activity that has students investigate the organs, histology, diseases and characteristics of the integumentary system. Students investigate the inflammatory response, observe the microscopic parts of their own integumentary system and learn how the skin is able to maintain an internal temperature when the external temperature fluctuates.
- Sunscreen & Skin Cancer - Students learn about UV radiation and its impact on the occurrence of skin cancer. Different SPF sunscreens are tested on UV sensitive paper to compare their ability to screen or block UV radiation. Students follow up by performing a patient analysis for three patients and determining whether the patients' moles may be indicative of melanoma.
- Investigating The Skin - Students learn about thermoregulation, glands and dermal nerves. Four activities have students investigate special characteristics of their own skin:
  - Use iodine and cornstarch-soaked sheets to locate sweat glands in the palm
  - Observe the cooling sensation caused by evaporative cooling produced by sweat
  - Map the location of mechanoreceptors, thermoreceptors and nociceptors in a small area of the forearm
  - Determine the two-point touch distance on several locations of their bodies
- Skin Cancer Interactive - An introductory section walks students through the basic biology of healthy skin and then explores the types of skin cancer, the causes of skin cancer and how to lower skin cancer risk. An interactive assessment allows students to gauge understanding. There are then two practical portions, where students screen skin samples for cancer and then field "calls" from patients concerned about skin cancer risks.

Assessments

Formative:

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- Each lab activity has open ended analysis and review questions assessing knowledge of that topic, including:
  - Identifying microscopic images of different types of epithelial tissues
  - Diagnosing potentially cancerous moles and writing treatment plans

Summative:

- Written quiz (multiple choice and open ended) assessing student understanding of the integumentary system's structure and function.

Benchmark: N/A

Alternative:

- Identifying microscopic images of different types of epithelial tissues, diagnosing potentially cancerous moles and writing treatment plans.

Interdisciplinary Connections

ELA:
WHST.9-12.9: Draw evidence from informational texts to support analysis, reflection and research. (HS-LS-1-1), (HS-LS1-6)
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), (HS-LS1-4), (HS-LS1-5), (HS-LS1-7)

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP3: Attend to personal health and financial well-being. Students investigate the function of their own skin and evaluate their own risk of skin cancer.

Time Frame	**2 Weeks**

Topic

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Skeletal System

Alignment to Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

Learning Objectives and Activities

Learning Objectives:

- What is the structure and function of the skeletal system?
- What is the importance of minerals like calcium to the skeletal system?
- How do doctors diagnose and treat bone fractures?
- What is the proper way to immobilize a bone injury for transport to a medical facility?
- Doctors use radiography (x-rays) to evaluate bone injuries and determine what kind of treatment (reduction, immobilization, etc.) is required.
- Bones should be immobilized above and below the injury in order to reduce further harm to the patient.

Learning Activities:

- Connective Tissue Histology Lab - Identify basic connective tissues including loose areolar, adipose, reticular, dense regular, dense irregular, hyaline cartilage, elastic cartilage, fibrocartilage, bone and blood. The activity is separated into three parts:
  - Part A introduces students to the function, location and structure of connective tissues
  - Part B is a practice activity to identify various slide images of connective tissues
  - Part C has students look at actual organ and tissue slides to find and identify connective tissues
- Skeletal System Lab - Station lab activity that has students investigate the organs, histology, diseases and characteristics of the skeletal system; investigate the construction and strength of long bones; determine height from long bone length and calculate skeletal proportions.
- Calcium & Osteoporosis Lab - Learn about different bone minerals and the importance of calcium to normal body functions; bone mineral homeostasis and how an imbalance can lead to osteoporosis; use chicken bones to observe the mineral salts and collagen components of bone tissue.
- Identifying X-rays Lab - Learn about radiography techniques and their uses in the medical field; common fractures; work as a radiologist to diagnose the location and

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type of fracture for 14 patients using printed x-ray images.
- Long Bone Immobilization Lab - Activity that allows students to practice splinting and immobilization of the forearm in case of fracture. The skills test is the same test for "Long Bone Immobilization" as that of the National EMT Registry exam.

Assessments

Formative:
- Analysis questions after each lab have students assess their understanding of the structure and function of the skeletal system, including reading x-rays and classifying the type of fracture or injury.

Summative:
- Written quiz (multiple choice and open ended) assesses student knowledge of skeletal topics, such as functions, bone types, fracture types and fracture treatments.
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Benchmark: N/A

Alternative:
- Students assess each other's performance on the National EMT Registry exam "Long Bone Immobilization" station; students are assessed on real clinical skills in both reading x-rays and immobilizing injuries.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements or performing technical tasks. Students must read and precisely follow directions on how to read x-rays and how to immobilize a long bone without causing further damage.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

Career Education

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CRP1: Act as a responsible and contributing citizen and employee. Students must work productively in a group to examine each other's characteristics, design & carry out an experiment and simulate an EMT situation.
CRP3: Attend to personal health and financial well-being. Students evaluate their own diets and how they may impact their bone health.
CRP4: Communicate clearly and effectively and with reason. Students must interpret the results of an experiment and communicate them to a "patient"; students must communicate each step of the EMT station with each other.
CRP11: Use technology to enhance productivity. Students use Chromebooks to view x-rays instead of printouts.
CRP12: Work productively in teams while using cultural global competence. Students must work productively in a group to examine each other's characteristics, design & carry out an experiment and simulate an EMT situation.

Time Frame	**2 Weeks**

Topic
Muscular System & Biomechanics

Alignment to Standards
HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. **CCC-6:** Structure and Function.

Learning Objectives and Activities

Learning Objectives:

- What is the structure and function of muscle and nervous tissue?
- What is the structure and function of the muscular system?
- How do healthcare professionals diagnose and evaluate muscle weakness or paralysis?
- How do bones, joints and muscles work together?
- How can we use physics concepts like speed, acceleration and force to optimize the human body?
- The rules of force and motion studied in physics can be applied to the human body to find ways of optimizing performance or daily life.

Learning Activities:

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- Muscle & Nervous Tissue Histology - Identify basic muscle and nervous tissues including skeletal muscle, smooth muscle, cardiac muscle, neurons and neuroglia. The activity is separated into three parts:
  - Part A introduces students to the function, location and structure of muscle and nervous tissues
  - Part B is a practice activity to identify various slide images of muscle and nervous tissues
  - Part C has students look at actual organ and tissue slides to find and identify muscle and nervous tissues
- Muscular System - Station lab activity that has students investigate the organs, histology, diseases and characteristics of the muscular system; measure muscle fatigue; perform a manual muscle test on a patient (partner); determine the relationship between muscle contraction and muscle size
- Biomechanics - Station activity that has students explore a variety of biomechanical characteristics of their own bodies:
  - Station A - determine their rate of speed and acceleration
  - Station B - determine the range of motion of the elbow and knee joints
  - Station C - measure the amount of force generated by the triceps, biceps, quadriceps and hamstrings
  - Station D - perform the Forestry Step Test to examine the link between muscle use and the increase in oxygen consumption by the body
  - Station E - determine the cadence, velocity and stride length of their gait.

Assessments

Formative:

- Open ended questions with each lab assess student understanding of muscular and biomechanics concepts.

Summative:

- Written quiz with both multiple choice and open ended sections assesses understanding of topics such as structure of muscles, clinical muscle tests and types of levers in the body.

Benchmark: N/A

Alternative:

- Students perform several real clinical tests on their partners, including functional evaluations (gait analysis, range of motion) and manual muscle tests.

Interdisciplinary Connections

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Mathematics:
MA.K-12.4: Model with mathematics. Students use math to analyze the mechanics and physics of the human body.
HSF-BF.A.1: Write a function that describes a relationship between two quantities. (HS-LS1-4)

Career Readiness, Life Literacies, and Key Skills

Technology Integration
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Career Education
CRP3: Attend to personal health and financial well-being. Students analyze their own gait, muscle strength and range of motion which can alert them to any health abnormalities. **CRP12:** Work productively in teams while using cultural global competence. Students must work together to perform all the clinical tests while also being mindful of their partner's personal space and comfort.

Time Frame	**2 Weeks**

Topic
Nervous System

Alignment to Standards
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **CCC-2:** Cause and Effect.

Learning Objectives and Activities
Learning Objectives: • What is the general structure and function of the nervous system? • How do nerve cells communicate with each other and with muscle cells? • How do the senses (taste, smell, touch, vision, hearing) work? • How do addictive drugs affect the brain and create addiction?

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- Electrical signals, created by ion gradients, cause impulses to move through nerve cells while neurotransmitters such as dopamine and serotonin carry the impulse from one cell to the next.
- Special receptor cells and processing areas in the brain work together to perceive and interpret sensory input.
- Addictive drugs mimic or alter neurotransmitters and receptors in the brain, leading to altered perception and creating physiological cravings which lead to addiction.

Learning Activities:

- Nervous System Station Lab Activity - Students investigate the organs, histology, diseases and characteristics of the nervous system; investigate whether they have any nerve damage in their forearms; visual acuity; determine their reaction time
- Cranial Nerves Lab Activity - This activity is set up to be conducted with a partner to test the function of their cranial nerves; each cranial nerve test is followed by a short description of disorders that may affect the function of that cranial nerve
- Smell & Taste Lab Activity - Students investigate characteristics of smell and taste; station activities allow students to:
  - Determine their olfactory acuity
  - Observe sense accommodation
  - Learn how taste and smell are linked
  - Compare taste sensations
- Drug Addiction & The Brain - Internet activity using animations and activities by the Genetics Science Learning Center on “Drug Abuse and Addiction”; students use the site to explore the symptoms and negative effects of several categories of drugs on neurotransmitters and/or receptors of the brain; explore causes of addiction and tolerance

Assessments

Formative:

- After each lab students will answer analysis questions assessing their understanding of each topic, including structure and function of neurons, name and function of cranial nerves and the mechanisms of addiction.

Summative:

- A written quiz will include multiple choice and open ended questions on topics such as identifying parts of a neuron, connecting structure to function in the system as a whole and explaining various functions of the system and senses.

Benchmark: N/A

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Alternative:

- Students conduct tests on their own senses (smell, vision, perception, hearing) and reaction times then assess the results to determine if they have any nerve malfunctions.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms. Students research and summarize various processes including how a nerve impulse travels through the body and how drugs of addiction work.

Career Readiness, Life Literacies, and Key Skills

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Technology Integration

9.4.12.IML.8: Evaluate media sources for point of view, bias and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6)

Career Education

CRP3: Attend to personal health and financial well-being. Students assess and analyze their own sensory and nervous function.
CRP7: Employ valid and reliable research strategies. Students must research how drugs affect the brain and how addiction happens.
CRP11: Use technology to enhance productivity. Students use their Chromebooks and interactive simulations to understand drugs and addiction.

Time Frame	**1 Week**

Topic

Cardiovascular System

Alignment to Standards

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

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HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
CCC-3: Scale, Proportion and Quantity.

Learning Objectives and Activities

Learning Objectives:

- What are the structural features and functions of the organs of the cardiovascular system?
- How do medical professionals measure and assess heart rate and blood pressure?
- How can the blood be analyzed and what information can be gleaned from this analysis?
- Hematocrit values and complete blood cell counts can give information about the health of the cardiovascular system as well as overall health issues.
- Electrocardiograms are recordings of electrical patterns in the heart and are the main tool to determine heart rate, rhythm and intervals.

Learning Activities:

- Cardiovascular System Station Lab Activity - Investigate the organs, histology, diseases and characteristics of the cardiovascular system; use a stethoscope to listen to specific valves of the heart and locate the pulse at several pulse points; practice taking blood pressure measurements using a manual sphygmomanometer; measure and determine whether the hematocrit of their patients is within the normal range
- Complete Blood Cell Count - Learn about the contents of blood and what can be diagnosed through a complete blood cell count; simulate complete blood cell count for four patients to determine whether each patient's RBC, WBC and platelet levels are high/low/normal; look at the patient's test results to formulate a diagnosis
- ECG Activity - Learn how to interpret electrocardiograms:
    - Part A has students go through an internet activity that teaches ECG reading and shows how to interpret electrocardiograms
    - Part B allows students to put the internet lesson to practice by interpreting electrocardiograms

Assessments

Formative:

- Written analysis questions after each lab assess understanding of topics such as organs, histology and diseases of the cardiovascular system; components of blood and how they change with disease; how to read an ECG.

Summative:

- Tasks at the end of the unit assess understanding of cardiovascular topics with multiple choice and open ended questions; topics include structure and function of the cardiovascular system; blood cell structure and function; how to identify a normal sinus rhythm of the heart.

Benchmark: N/A

Alternative:

- Students practice real clinical assessments including taking pulse, listening to heart rate and rhythm, evaluating a complete blood cell count and analyzing an ECG for rate, rhythm and various intervals.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements or performing technical tasks. Students must read and follow a complex set of steps to use the sphygmomanometer.

Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans and debt repayment.

Technology Integration

Career Education

CRP2: Apply appropriate academic and technical skills. Students practice skills that will assist them in the healthcare workplace including research, taking vital signs and assessing tests like hematocrit and complete blood cell count.
CRP3: Attend to personal health and financial well-being. Students evaluate their own, as well as a partner's cardiovascular health, in terms of heart rate and rhythm and blood pressure.
CRP7: Employ valid and reliable research strategies. Students use their evaluation of a complete blood cell count to research possible diagnoses and treatments.
CRP11: Use technology to enhance productivity. Students use an interactive review tool for nursing students to learn how to read an ECG.

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Time Frame	**2 Weeks**

Topic

Respiratory System

Alignment to Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
CCC-7: Stability and Change.
HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.

Learning Objectives and Activities

Learning Objectives:

- What symptoms can indicate problems with the respiratory system?
- How do healthcare workers measure lung function and capacity?
- What can cause respiratory distress and how does respiratory distress affect the patient physically and mentally?
- How can air quality of a patient's environment affect their health?
- Respiratory distress can be caused by many respiratory disorders, such as asthma, and causes changes in the patient's heart rate, respiratory rate and mental distress level.
- Air quality can be affected by natural and human-caused factors and it can contribute to respiratory distress and illnesses. (Effects of Climate Change)

Learning Activities:

- Respiratory System Station Lab Activity - Students investigate the organs, histology, diseases and characteristics of the respiratory system; perform a spirometry test to measure tidal volume, expiratory reserve volume, inspiratory reserve volume, vital capacity and total lung capacity; practice auscultating lung sounds and taking respiratory rates; perform a simulated analysis of a patient to determine what is causing respiratory distress
- Respiratory Distress - Students learn how to recognize respiratory distress and the most common causes including asthma and COPD (chronic bronchitis and emphysema); lab activity using different diameter straws to simulate constriction of airways; assess the respiratory rate and pulse of test subjects breathing through the straws at rest and during exercise
- Air Quality & Health - Students identify the amount of particulate matter pollution in

outdoor or indoor locations of their choice; assessment of environmental factors; use an air quality index to determine respiratory safety used throughout the lab; review the impact of air pollution on respiratory health
- Create a graphic depiction of the relationship between respiratory illnesses, air pollution, and the potential influence of climate change

Assessments

Formative:
- Each lab activity ends with analysis questions assessing topics such as how to measure and evaluate lung function, causes and symptoms of respiratory disorders and the connection between environment and health.

Summative:
- Tasks with both multiple choice and open ended parts assess understanding of the structure and function of the respiratory system, respiratory disorders and causes of respiratory distress.

Benchmark: N/A

Alternative:
- Students are assessed on their performance of real clinical skills including measuring lung volume and capacity, auscultating lung sounds, taking respiratory rates and diagnosing respiratory distress.
- Respiratory health cases that are driven by air quality and climate change effects.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements or performing technical tasks. Students must carefully read and follow directions when performing a mock surgery and a dissection.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4)

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Career Education
CRP3: Attend to personal health and financial well-being. Students assess their own lung function and compare it to average values for their age group and sex. **CRP12:** Work productively in teams while using cultural global competence. Students must work as teams to simulate respiratory distress and to carry out an air pollution study.

Time Frame	**1 Week**

Topic
Digestive System

Alignment to Standards
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **CCC-5:** Energy and Matter.

Learning Objectives and Activities

Learning Objectives:

- How are the structure and function of the digestive system linked?
- What are the common diagnostic tests to check for illnesses of the digestive system?
- What are the causes, symptoms and preventative measures for foodborne illness?
- What constitutes a healthy diet?
- Foodborne illness is caused by pathogens or chemicals in food often causing flu-like symptoms, diarrhea and vomiting and can be prevented by proper handling, refrigeration and heating of food.
- A healthy diet consists of balanced nutrients including carbohydrates, proteins, fats, sodium and sugars and must include a healthy number of calories based on the person's BMR (basal metabolic rate).

Learning Activities:

- Digestive System Station Lab Activity - Students investigate the organs, histology, diseases and characteristics of the digestive system; length of the digestive system will be simulated with string, the time from swallowing until it reaches the stomach will be measured; simulated fecal occult blood test will be performed; charts/information are provided for each station
- Bacteria In Food Lab Activity - Students observe the amount of bacteria that develops

in yogurt or milk left out for different periods of time; act as a family physician educating a patient on the importance of refrigeration to deter bacterial growth in milk products
- "What's In Your Food?" Lab Activity - Students investigate nutritional facts; choose a favorite meal and measure out the amount of fat, salt and sugar; meals are then compared among the class

Assessments

Formative:
- End of lab analysis questions cover concepts like structure, function, histology and diseases of the digestive system; causes, symptoms and prevention of foodborne illness; nutritional needs of the average person.

Summative:
- A written quiz at the end of the unit uses open ended questions to assess understanding of structure, function, histology and diseases of the digestive system; causes, symptoms and prevention of foodborne illness; nutritional needs of the average person.

Benchmark: N/A

Alternative:
- Students make a model of the digestive system to illustrate the relationship between sizes of organs and plan a whole day of meals that falls within the FDA recommended guidelines.

Interdisciplinary Connections

Mathematics:
MA.K-12.4: Model with mathematics. Students use math skills to ensure their meal plan is within FDA-recommended values.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

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CRP3: Attend to personal health and financial well-being. Students analyze their own diets to assess their nutrition.
CRP4: Communicate clearly and effectively and with reason. Students practice communicating the importance of refrigeration to a patient with foodborne illness.
CRP7: Employ valid and reliable research strategies. Students must use patient information and other resources to diagnose a specific foodborne illness.
CRP12: Work productively in teams while using cultural global competence. Students must work together to plan a whole day of meals that falls within the FDA recommended guidelines.

Time Frame	**1 Week**

Topic

Reproductive System & Fertility

Alignment to Standards

HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Learning Objectives and Activities

Learning Objectives:

- What is infertility and what are its common causes?
- What fertility treatments are available?
- How do human babies develop?
- What are the risks to mother and baby associated with babies that are either too large or too small for their gestational age?
- Infertility is diagnosed when a couple hasn't conceived after 12 months and can be caused by a variety of factors, from gamete formation to implantation of the embryo, in either the male or female.
- Fertility treatments work by increasing ovulation or ejaculation, stabilizing hormones and/or using in-vitro or in-vivo techniques for fertilization and/or development.

Learning Activities:

- Fertility - Students will act as fertility specialists for four couples seeking fertility assistance; compare medical backgrounds and hormone test results to normal values to determine what may be causing the couples' infertility; follow up with research to create a treatment plan for each couple.
- Fetal Development - Students continue as the fertility specialist for the three couples

that were able to conceive from Lab 16b; data on fetal size and development is compared to normal values to determine whether the fetus is developing at a normal rate.

Assessments

Formative:

- Each lab activity is followed by analysis questions assessing understanding of fetal development and fertility.

Summative:

- Tasks at the end of the unit assess knowledge of fertility, fetal development and pregnancy risks.

Benchmark: N/A

Alternative:

- Students use patient history and medical tests to diagnose causes of infertility. Then write case treatment plans for each couple and use a graph to analyze and display fetal development data.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms. Students must identify the key points in the patient histories, then read and summarize information about fertility treatments for specific issues.

Mathematics:
MA.K-12.4: Model with mathematics. Students use graphing skills to represent average fetal growth rates and patient data.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

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CRP2: Apply appropriate academic and technical skills. Students research causes of infertility and generate a treatment plan.
CRP4: Communicate clearly and effectively and with reason. Students must write a treatment plan for a patient.
CRP7: Employ valid and reliable research strategies. Students research causes of infertility and generate a treatment plan.
CRP11: Use technology to enhance productivity. Students use the internet and medical websites to research causes and treatments of infertility.

Time Frame	**1 Week**

Topic

Global Health

Alignment to Standards

CCC-1: Patterns.
SEP-3: Planning and Carrying Out Investigations.

Learning Objectives and Activities

Learning Objectives:

- What are the major infectious disease threats in the world today?
- How do education and poverty impact health and life expectancy?
- How are patient history and symptoms important when diagnosing disease?
- An epidemic is a widespread outbreak of a contagious disease, often first identified by general practitioners and emergency department workers.
- Epidemics are controlled by a combination of diagnosing and derating patients, and public outreach to control the spread.

Learning Activities:

- Global Health Investigation - Students will have the opportunity to investigate the status of medicine, disease and health access on a global scale; use interactive maps of life expectancy, annual income and literacy to compare the occurrence and mortality rates of several infectious diseases; research current investigators of global health issues; PBS videos can be purchased to supplement.
- Epidemiology - Students role-play as healthcare workers and/or patients. The healthcare worker performs a patient exam and records pertinent history and symptoms in order to discover the infectious agent the patient may have contracted.

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Assessments

Formative:

- Analysis questions have students interpret global health data and determine the proper treatment for an infectious disease.

Summative:

- On the final assessment, students are asked to state the relationship between education (literacy), poverty (GDP) and life expectancy. Then they suggest non-medical ways to increase life expectancy in developing countries.

Benchmark: N/A

Alternative:

- Students analyze global health data and draw conclusions; use symptoms and history to diagnose a patient with an infectious disease.

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms. Students pull pertinent information from readings about patient symptoms and history and from data about global health information.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP2: Apply appropriate academic and technical skills. Students research global health data and perform diagnoses.
CRP7: Employ valid and reliable research strategies. Students use an interactive map to determine the relationship among education, income and health.
CRP11: Use technology to enhance productivity. Students use an online interactive tool to determine the relationship among education, income and health; research infectious disease treatment online.

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CRP12: Work productively in teams while using cultural global competence. Students work in groups to act as patients and healthcare workers.

Time Frame	**2 Weeks**

Topic

Pathology & Autopsy/Body System Project

Alignment to Standards

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
CCC-4: Systems and System Models.
CCC-6: Structure and Function.

Learning Objectives and Activities

Learning Objectives:

- What is surgery and when is it used?
- What is an autopsy and when is one performed?
- How are all the systems we studied linked together?
- The systems studied this semester all work together to sustain life.

Learning Activities:

- Surgery & Suturing - Students will learn about common surgical procedures and suturing techniques; act as part of a surgical team that conducts an appendectomy, removal of the kneecap, a cesarean section and open heart surgery on a model patient.
- Pathology & Autopsy - A video-based activity using “The Autopsy Files” by the renowned medical examiner Dr. Baden. Students learn about how forensic pathology and autopsy can be used in criminal investigations to identify a victim and solve crimes.
- Fetal Pig Autopsy - Students will act as part of a medical examiner’s team to conduct an autopsy on a fetal pig which will include removing and weighing each organ followed by completing an autopsy report on the victim.

Assessments

Formative:

- Analysis questions review definitions and applications of surgery, suturing and

pathology concepts and terms.

Summative:

- Students generate an autopsy report at the end of the fetal pig "autopsy" (dissection).

Benchmark:

- Content (multiple choice) assessing knowledge of body systems, anatomy terms and physiology of disease; skills (essay) assessing ability to synthesize information from multiple units.

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.11-12.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements or performing technical tasks. Students must carefully read and follow directions when performing a mock surgery and a dissection.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP1: Act as a responsible and contributing citizen and employee. Each student must take a role in both the surgery and autopsy labs.
CRP2: Apply appropriate academic and technical skills. Students must glean information from a documentary about autopsy; they also practice clinical skills like dissection and suturing.
CRP4: Communicate clearly and effectively and with reason. Students generate an autopsy report which must concisely and accurately summarize their findings.
CRP12: Work productively in teams while using cultural global competence. Each student must take a role in both the surgery and autopsy labs.

Modifications (ELL, Special Education, At Risk Students, Gifted & Talented, & 504 Plans)

ELL:

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- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

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Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns