Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	**Anatomy and Physiology**
Grade Level(s):	**11-12**

Duration:	*Full Year:*	**x**	*Semester:*		*Marking Period:*	

Course Description:	**This course is analogous to what a student would experience in Anatomy and Physiology I at the collegiate level. In addition, this course covers some of the topics in a typical Anatomy and Physiology II course. Both structure and function of the following body systems are covered: Integumentary system, Skeletal system, Muscular system, Nervous system, Respiratory system, Cardiovascular system and Digestive system. In addition, all systems are approached from the tissue level. In every system, the specific structure of a tissue is studied to determine why it functions in a particular way. All homeostatic imbalances are analyzed by first identifying the structural change of the tissue and then the new function resulting from the change.** **The laboratory portion of this course involves dissections, models and practicums for the study of structures. Case studies are used for application of physiological principles. Application is a key skill emphasized throughout the course.**
Grading Procedures:	**Test: 50%** **Quizzes: 25%** **Labs: 25%**
Primary Resources:	**Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew** **Online Resources: Mastering Anatomy and Physiology/Interactive Physiology at www.masteringaandp.com , Next Generation Science Standards at www.nextgenscience.org/ and New Jersey Student Learning Standards (NJSLS)**

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Costa Tsoukalis and Mary Howard

Under the Direction of:	Dr. Patricia Hughes

Written: _____

Revised: _____

BOE Approval: _____

Unit Title: Unit 1 - Organization of the Body

Unit Description: This unit focuses on the concept that all organisms, including humans, are organized. Humans are organized from basic units called cells, to tissues, organs, organ systems and the whole body. Cells, tissues, organs, and organ systems are organized in many ways. The study of the organization of these structures is anatomy. Physiology of any organism is based on biochemistry. Pathologies of cells and tissues result in disease.

Unit Duration: 2 Weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- Any organism, including humans, can be organized from the simplest structure to the most complex; that is, from atom, to molecule, to cell and so on.
- The cell is the basic structure of all living things. The physiology of an organism is based on chemistry and physics that occur at the cellular or tissue level.
- Homeostasis is an organism's ability to maintain a stable internal environment.
- Pathologies of cells and tissues are imbalances in homeostasis that result in disease or death.

Essential Questions:

- How do anatomists organize the human body?
- What is the basic structure of living things?
- What prior knowledge is necessary to understand how living things operate?
- How do organisms maintain the chemical and physical balance necessary to live?
- What happens when there is an imbalance in the organism?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Describe anatomical position and label body using anatomical terms
2. List three planes and identify body cut into planes
3. Give examples of complementarity of structure and function
4. Describe the elements of a homeostatic control system
5. Relate diabetes and hypoglycemia to imbalance in homeostasis and negative feedback mechanisms

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 2 and 3: Biochemistry
- Quiz Chapter 1: Landmarks
- Language of Anatomy Lab
- Forensic (Microscope) Lab

6. Define basic chemistry terms and explain the relationship between atom, molecule, ion, and isotope 7. Relate structure of ion to its function in physiology 8. Identify chemical reactions and list factors affecting rates of reactions 9. Define and list special properties of water, salts, acid and bases that make these chemicals necessary to life 10. Define pH, buffer and explain basics of blood buffering system 11. Explain structural and functional differences between lipids, proteins, carbohydrates, and nucleic acids 12. Describe plasma membrane according to fluid mosaic model and list components of membrane 13. Describe structure and function of membrane junctions 14. Distinguish between active and passive transport 15. Describe diffusion, facilitated diffusion, osmosis; vesicular transport 16. Define metabolism and give examples	

Benchmarks: Unit 1 (Chapter 1) Test

Learning Plan

Learning Activities:
Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 1, 2 and 3; *Language of Anatomy,* Marieb Lab Manual (modified); *Forensics Lab* by Carcel and Cardamone.

Lecture Topics:
- Lab Safety
- Language of Anatomy
- Cellular Transport
- Homeostasis/Feedback Loops
- Medical Imaging

Textbook:
- Martini: Chapter 1, pages 1 to 23
- Marini: Chapter 2, pages 27 to 59
- Martini: Chapter 3, pages 65 o 109

Laboratory Exercises:
- Language of Anatomy
- Diabetes
- Introduction to the Microscope

Mastering A & P:
- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- A&P Flix
    - Membrane Transport
    - DNA Replication
    - Protein Synthesis

    - Mitosis
- Animations
- MP3 Tutor Sessions
- Flashcards

Case Study:

- Using A&P to Save a Life (Vital Signs)
- What is Wrong with My Baby? (Cystic Fibrosis)
- The Beat Must Go On! (PCD/Primary Ciliary Dyskinesia)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 1,2,3
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: The Visible Human Project at www.nim.hih.gov.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops, The Virtual Body: Homeostasis(DVD).
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: levels of organization, homeostasis and disease, blood buffering, and medical imaging.
- Clinical Notes, including but not limited to: diabetes, cancer,

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Infer how changes to the insulin negative feedback loop causes Diabetes
3.0	**Students will be able to:** In addition to 2.0 performance: • Describe negative feedback loops and identify when the body uses them • Describe positive feedback loops and identify when the body uses them
2.0	**Students will be able to:** • Recall specific vocabulary: anatomy, appendicular, axial, cardiovascular, digestion, excretion, homeostasis, metabolism, negative feedback, organelle, organism, pericardial, peritoneal, physiology, pleural, reproduction, respiration, thoracic, visceral. • Recognize that the body has control systems.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Explain how the design of the cellular wall allows cells to generate and propagate electrical impulses.
3.0	**Students will be able to:** In addition to 2.0 performance: • Differentiate between: desmosomes, tight junctions and gap junctions • Classify and Identify: integral proteins of cell membrane, Na-K pump, leak channels • Classify and Identify cellular transport: osmosis, endocytosis, exocytosis, transcytosis • Describe action potential and membrane potential
2.0	**Students will be able to:** • Recall specific vocabulary including: Cell, osmosis, buffer, membrane potential, microfilaments, actin, intermediate filaments, cytoskeleton, microtubules, tubulin, microvilli, cilia, permeability, differentiation, transmembrane potential, resting potential, exocytosis, endocytosis, diffusion, facilitated diffusion, active transport • Recognize that the body is contains many different cells and they all have different functions
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development

of appropriate plans.	

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); HS.PS2.B (HS-LS1-7); HS.PS3.B (HS-LS1-5),(HS-LS1-7)
- Life Science: HS.LS3.A (HS-LS1-1)

Common Core State Standards Connections: ELA /Literacy

- RST .11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- WHST .9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST .9-12.7 Conduct short, as well as, more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST .11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST .9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
- 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.

Common Core State Standards Connections: Mathematics

- MP.4 Model with mathematics.
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- HSF-BF.A.1 Write a function that describes a relationship between two quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 2: Tissues and Covering of the Body

Unit Description:

This unit focuses on how a variety of cell types arranged in various combinations to form tissues, structures with discrete structural and functional properties. Tissues in combination form organs, such as heart or liver, and in turn organs can be grouped into 11 organ systems. In addition, this unit considers the structure and the multiple varied functions of skin and the integumentary system.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- Histology is the classification of tissues in the human body
- Tissues are composed of and identified by the cells that make them.
- The physiology of an organism is based on chemistry and physics that occur at the cellular or tissue level.
- The major function of skin is protection, but has far reaching effects on the whole body.
- Knowledge of the integumentary system and its individual components leads to the understanding of associated disorders

Essential Questions:

- What is the purpose of tissue?
- What are tissues made of?
- How are tissues of the body classified?
- What is the role of the integumentary system
- How is skin structured?
- What is the purpose of skin?
- How does skin function?
- What are the associated disorders of the integumentary system?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Define tissue, describe microscopic anatomy of four types, locate and describe function of four types
2. Differentiate between types of epithelial tissue and describe, locate and give functions of each
3. List characteristics of connective tissue; recognize various types of CT on slides; give functions of each type
4. Recognize three types of muscle tissue
5. Recognize nervous tissue
6. List steps of tissue repair

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 4: Tissue Identification and Labeling
- Quiz Chapter 5: Skin Diagram
- Skin Lab

7. Define pathology 8. Describe cancer, causes of, diagnosis, prevalence, treatments 9. Name tissue types in each layer of dermis and epidermis and describe functions of each layer 10. Describe factors that normally contribute to skin color and how changes in skin color may indicate disease 11. Describe the structure and composition of hair and nails 12. Compare and contrast various glands of skin 13. List five functions of skin and describe how skin accomplishes these functions 14. Describe how to determine extent of burn and explain why burns are serious 15. Differentiate between 16. 1st, 2nd and 3rd degree burns 17. Summarize characteristics of three types of skin cancer	

Benchmarks: Lab Practical on Tissues and Unit 2 (Chapter 4 & 5) Test

Learning Plan

Learning Activities:
Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 4 and 5, Various videos on skin physiology; Skin lab; Wound and wound care videos and independent tissue work on microscope.

Lecture Topics:
- Epithelial Tissue
- Connective Tissue
- Muscle Tissue
- Nervous Tissue
- Tissue Repair/Trauma
- Skin Structure
- Skin Diseases
- Skin Cancer/Burns

Textbook:
- Martini: Chapter 4, pages 114 to 146
- Martini: Chapter 5, pages 152 to 175

Laboratory Exercises:
- Tissue Practicum
- Skin Lab

Mastering A & P:
- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- Animations
- MP3 Tutor Sessions
- Flashcards

Case Study:

- The Rubber Girl (Ehlers-Danlos syndrome)
- He has Fish Skin! (Ichthyosis Vulgaris)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 4 and 5
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Dartmouth Virtual Histology at http://www.dartmouth.edu/~anatomy/Histo/; University of Delaware Histology at http://www1.udel.edu/biology/Wags/histopage/colorpage/colorpage.htm.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops,
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: epithelial tissue, connective tissue, muscle tissue, nerve tissue, cancer, tissue repair, burns and infection
- Clinical Notes, including but not limited to: exfoliative cytology, Marfan syndrome, problems with serous membranes, skin cancer, decubitus ulcers, liposuction, burns and grafts and skin abnormalities.
- Various classroom models of tissues, burns and skin

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Infer that alterations at cellular level is the basis of most pathologies • Infer that cancer occurs because of a breakdown in normal cell function during mitosis
3.0	**Students will be able to:** In addition to 2.0 performance: • Trace the development of cancer from genetic mutation, to cancer, to treatment/death • Develop: a timeline of tissue repair
2.0	**Students will be able to:** • Recall specific vocabulary including: pathology, cancer, genetic mutation, diagnosis • Recognize that cancer is caused by changes to cells
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Associate specific structures which dictate the function of a tissue
3.0	**Students will be able to:** In addition to 2.0 performance: • Differentiate between: types of epithelial tissue and connective tissue • Classify and Identify: microscopic anatomy of epithelial and connective tissue • Classify and Identify: location and functions of epithelial and connective tissue • Examine the similarity and differences between epithelial and connective tissue
2.0	**Students will be able to:** • Recall specific vocabulary including: adipose tissue, cartilage, chondrocyte, connective tissue, epithelial tissue, fibroblast, fibrous tissue, macrophage, muscle tissue, nervous tissue, neuroglia, neuron, osteocyte, osteon. • Realize that the body is made of different tissues • Describe the major functions of each type of connective tissue • Describe the major functions of each type of epithelial tissue • Describe the major functions of each type of muscle tissue
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Unit Modifications for Special Population Students	
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Common Core State Standards Connections: Mathematics

- MP.4 Model with mathematics.
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
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Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

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Unit Title: Unit 3: Support of Body

Unit Description: This unit focuses on the functional anatomy of the bones that form the axial and appendicular skeleton and the concept that bones are the support system for the body. Anatomic and physiologic functions of this system are discussed. In addition to supporting the weight of the body, bones work together with muscles to maintain body position and to produce controlled, precise movements. This unit also considers that ways bones interact/interconnect and examines the mechanisms involved with the growth, remodeling, and repair of the skeleton.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
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Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- The skeletal system has five primary; functions.
- Bones are classified according to shape, structure and feature surface markings
- Bone is composed of matrix and several types of cells
- Compact bone contains parallel osteons and spongy bone contains trabeculae
- Bone forms through ossification and enlarges through appositional growth and remodeling
- Bone growth and development depend on balance between bone formation and bone reabsorption
- Exercise, hormones and nutrition affect bone development and the skeletal system
- Calcium plays a critical role in bone physiology
- A fracture is a crack or break in a bone
- Aging has widespread effects on skeletal tissue
- The 80 bones of the head and trunk make up the axial skeleton
- Joints are categorized according to their range of motion or anatomical organization
- Advancing age alters joint function

Essential Questions:

- What are the major elements of the skeletal system?
- What are the major functions of the skeletal system?
- How are bones classified?
- What are the major cells of bone?
- What is the difference between compact and spongy bone?
- How does bone form?
- How does bone tissue grow or enlarge?
- What is the difference between bone formation and bone reabsorption?
- What the major effectors of the skeletal system?
- What role does calcium play in bone physiology?
- What is the role of calcitonin and parathyroid hormone?
- What is a fracture?
- What is the difference between osteopenia and osteoporosis? How are they related?
- What is the axial and appendicular skeleton? What are the bones that make up each?
- What are the major classification of joints?
- What are some of the diseases and disorders associated with aging joints?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Locate areas of cartilage on adult skeleton
2. Describe properties of three different types of cartilage
3. Describe the gross anatomy of a typical long and flat bone and locate and give functions of red marrow, yellow marrow, articular cartilage, periosteum, and endosteum
4. Describe histology of compact and spongy bone
5. Discuss chemical composition of bone and why it is important not just to bone strength but as a reservoir
6. List and describe five functions of bone
7. Describe process of ossification that occurs in an embryo and compare to long bone growth at epiphyseal plate
8. Compare the location and functions of osteoblasts, osteocytes and osteoclasts
9. Explain how remodeling of bones is controlled by hormones and mechanical stress
10. Recognize the stages of healing in a fracture
11. Describe disorders of bone remodeling, especially osteoporosis
12. Name major parts of axial and appendicular skeleton and give functions of each
13. Compare and contrast the structure of the four classes of bones and give examples of each
14. Name types of bone markings and indicate function of each
15. Identify all major bones of human body and major bone markings
17. Define joint
18. Classify joints structurally and functionally
19. Locate examples of each type of joint
20. Discuss symptoms and problems associated with the most common joint injuries
21. Differentiate between different types of arthritis

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 6: Bone Tissue
- Quiz Chapter 6: Bone Formation and Remodeling
- Quiz Chapter 8: Types of Joints
- Bone Tissue Lab
- Joint Lab

Benchmarks: Bone Practicum; Unit 3 (Chapter 6 and 9) Test

Learning Plan

Learning Activities:

Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 6 to 9; Practicum on bones; Joint lab, Bone tissue lab and independent tissue work on microscope.

Lecture Topics:

- Bone Formation
- Bone Physiology
- Bone Remodeling
- Bone Diseases/Osteoporosis

Textbook:

- Martini: Chapter 6, pages 180 o 204

- Martini: Chapter 7, pages 208 to 239
- Martini: Chapter 8, pages 243 to 260
- Martini, Chapter 9, pages 265 to 286

Laboratory Exercises:

- Bone Tissue Lab
- Bone Practicum
- Joint Lab
- Knee Replacement Surgery

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- Animations
    - Group Muscle Actions and Joints
- MP3 Tutor Sessions
- Flashcards

Case Study:

- A Case of Child Abuse? (Osteogenesis Imperfecta)
- Knocked Out (Fractures and CT scans)
- Timber! (Clavicle Fracture)
- What's the Matter with the Birthday Girl? (Juvenile Rheumatoid Arthritis)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 6 to 9
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Bone Remodeling at http://courses.washington.edu/bonephys/physremod.html; The Visible Body at https://www.visiblebody.com/learn/skeleton/types-of-bones; Chapter review activities at http://wps.aw.com/bc_marieb_hap_9_oa/218/55856/14299278.cw/-/14305732/index.html; Anatomy drill and practice at http://www.wiley.com/legacy/college/tortora/0470565101/anatomy_drill/interface.html; and various YouTube videos for content knowledge reinforcement and review.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: types of fractures, steps in bone repair, and synovial joints
- Clinical Notes, including but not limited to: heterotopic bone formation, abnormal bone development, temporomandibular joint syndrome, craniostenosis, kyphosis, lordosis, scoliosis, carpal tunnel syndrome, bursitis, bunions and knee injuries.
- Various classroom models of bones and joints
- Articulated and disarticulated skeletons

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Predict how changes in hormone levels and physical activity will alter bone density
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the negative feedback loop that controls bone density by changing the levels of calcitonin and Parathyroid Hormone (PTH) • Explain the roles of osteoblasts, osteocytes and osteoclasts • Identify and explain the role of calcitonin and Parathyroid Hormone (PTH)
2.0	**Students will be able to:** • Recall specific vocabulary including: osteoporosis, osteopenia, parathyroid glands, parathyroid hormone, calcium, calcitonin, bone mineral density test, bone scan • Realize that bone density changes over lifetime
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Model how the microscopic structure of bone allows it to resist both torque and pressure stresses
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the micro and macroscopic structure on bone tissue • Explain the steps of bone remodeling • Explain the steps of bone healing
2.0	**Students will be able to:** • Recall specific vocabulary including: sutural bones, irregular bones, short bones, flat bones, long bones, sesamoid bones, bone markings, diaphysis, epiphysis, metaphysis, compact bone, medullary cavity, spongy bone, cortex, hydroxyapatite, osteocytes, lamellae, canaliculi, osteoblasts, ossification, osteogenesis, osteoid osteoprogenitor, osteoclasts, osteolysis, osteolysis, osteon, central canal, perforating canals, trabeculae, red bone marrow, yellow bone marrow, periosteum, endosteum, primary ossification center, secondary ossification center, articular cartilage, epiphyseal cartilage, epiphyseal line, ossification center, spicules, remodeling, • Recognize that bone is constructed of both organic and inorganic materials
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/lea/ELLSupport.pdf)	Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); HS.PS2.B (HS-LS1-7); HS.PS3.B (HS-LS1-5),(HS-LS1-7)
- Life Science: HS.LS3.A (HS-LS1-1)

Common Core State Standards Connections: ELA /Literacy

- RST .11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- WHST .9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST .9-12.7 Conduct short, as well as, more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST .11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST .9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
- 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.

Common Core State Standards Connections: Mathematics

- MP.4 Model with mathematics.
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- HSF-BF.A.1 Write a function that describes a relationship between two quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 4: Movement of the Body

Unit Description: This unit focuses on the histological and physiological characteristics of muscle tissue and how these characteristics relate to the overall function of the muscular system. Also considered is how muscles move the body, convert chemical energy into mechanical energy and apply force to the skeleton system. In addition, this unit also describes the gross anatomy of the muscular system and the functional relationship between muscles and bones of the body.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- Muscle tissue makes up half the body's mass.
- Muscle's ability to transform chemical energy into mechanical energy allows muscle to exert force and provides movement.
- Muscle tissue works by a complex physiological mechanism.
- Skeletal muscle performs six major functions
- A skeletal muscle contains muscle tissue connective tissues, blood vessels, and nerves
- Skeletal muscle fibers have distinctive features
- The nervous system communicates with skeletal muscles at the neuromuscular junction
- Sarcomere shortening and muscle fiber stimulation produce tension
- ATP provides energy for muscle contraction
- Muscle performance capabilities depend on muscle fiber type and physical conditioning
- Cardiac muscle tissue differs structurally and functionally from skeletal muscle tissue
- Smooth muscle tissue differs structurally and functionally from skeletal and cardiac muscle tissue
- With advancing age, the size and power of muscle tissue decrease
- Exercise produces responses in multiple body systems

Essential Questions:

- What are the major functions of skeletal muscle?
- What is the basic anatomical structure of muscle?
- What are the types of muscles found in the body?
- What is the neuromuscular junction and how does it communicate with muscle tissue?
- How does ATP provide energy for muscle tissue?
- What is the difference between aerobic and anaerobic metabolism in muscle tissue?
- How does fiber type and conditioning affect muscle performance?
- What is the difference and similarities between skeletal, cardiac and smooth muscle?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. List four important functions of muscle tissue
2. Describe gross anatomy of skeletal muscle
3. Describe microscopic anatomy of skeletal muscle and relate to function
4. Sequence the events that occur at the neuromuscular junction and in a muscle fiber during a contraction
5. Define muscle twitch and describe how a smooth graded contraction occurs
6. Relate benefits and drawbacks of aerobic and anaerobic exercise
7. Define oxygen debt and what occurs during muscle fatigue
8. Describe factors that influence force, velocity, and duration of muscle contraction
9. Describe how exercise effects muscle
10. List some common muscle injuries and treatments for those
11. Describe most common type of muscular dystrophy, Duchenne's
12. List criteria used to name muscles
13. Define and give examples of prime movers, antagonists, and synergists
14. Name and identify major muscles of the body
15. Describe how muscles work to cause movement

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 10: Muscle Cell Anatomy
- Quiz Chapter 10 Neuromuscular Junction
- Quiz Chapter 10: Steps of Muscle Contraction
- Microscopic Bone Lab
- Muscle Tissue Lab
- Grip Strength Lab

Benchmarks: Cat Practicum, Unit 4 (Chapter 10) Test

Learning Plan

Learning Activities:

Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 10 and 11; Dissection of cat; Muscle tissue histology; Grip strength and fatigue lab

Lecture Topics:

- Muscle Anatomy
- Neuromuscular Junction
- Sliding Filament Theory
- Muscle Contraction/Motor Unit
- Medical Imaging

Textbook:

- Martini: Chapter 10, pages 292 to 329
- Marini: Chapter 11, pages 336 to 383

Laboratory Exercises:

- Muscle Tissue Lab
- Grip Strength and Fatigue
- Cat Practicum

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- A&P Flix
    - Events at the Neuromuscular Junction
    - Excitation-Contraction Coupling
    - Cross-Bridge Cycle
    - Origins, Insertions, Actions, Innervations
    - Group Muscle Actions and Joints
- Animations
- MP3 Tutor Sessions
- Flashcards

Interactive Physiology

- Anatomy Review: Skeletal Muscle Tissue
- The Neuromuscular Junction
- Sliding Filament Theory
- Muscle Metabolism
- Contraction of Motor Units
- Contraction of Whole Muscles

Case Study:

- Keep On, Keepin' On (Myasthenia Gravis)
- Downward-Facing Dog (Muscle Injury and Recovery)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 10 and 11
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Virtual Cat Dissection at http://www.3dtoad.com/dissections_cat.php and https://homes.bio.psu.edu/faculty/strauss/anatomy/musc/muscular.htm; Various video and anatomical tutorials in Interactive Physiology at www.masteringaandp.com.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: skeletal muscle innervation, the contraction cycle, the neuromuscular junction, sliding filament theory, muscle metabolism, and contraction of muscle units and whole muscles.
- Clinical Notes, including but not limited to: Tetanus, rigor mortis, delayed-onset muscle soreness, hernia, and intramuscular injections,
- Vernier: Labs #16 and #17 (and if time allows parts of #15 and/or #18) Grip Strength and Muscle Fatigue
- Various classroom models of muscle cell and contractile apparatus

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Explain how small changes to the muscle cell structures cause the severe physiological effects of muscular diseases
3.0	**Students will be able to:** In addition to 2.0 performance: • Describe the basic symptoms of muscular disease and disorders • Identify the structural parts on muscle cells that are most often susceptible to disease changes
2.0	**Students will be able to:** • Recall specific vocabulary including: myopathy, physical therapist, hypertrophy, atrophy, aerobic endurance • Identify the following muscular diseases: Muscular Dystrophy, Rigor mortis, Myasthenia gravis, botulism, fibromyalgia
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Predict the exact physiological effects changes in ATP and oxygen levels will have on the contraction ability of a muscle
3.0	**Students will be able to:** In addition to 2.0 performance: • List the steps of a muscle contraction • Describe how a muscle cell generates and propagates an action potential • Explain the specific role the sarcoplasmic reticulum, sarcoplasm, T-Tubules, Z-discs, actin, myosin, ATP, O_2 and sarcomere have in a muscle contraction
2.0	**Students will be able to:** • Recall specific vocabulary including: actin, antagonist, aponeurosis, facia, insertion, motor neuron, motor unit, muscle impulse, myofibril, myosin, neurotransmitter, origin, oxygen debt, prime mover, recruitment, sarcomere, synergist, threshold stimulus, muscle fatigue • Name the major parts of the skeletal muscle fiber and describe the function of each. • Explain the major events that occur during muscle fiber contraction.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
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Unit Modifications for Special Population Students	
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Common Core State Standards Connections: Mathematics

- MP.4 Model with mathematics.
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
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Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 5: Regulation and Integration of the Body

Unit Description: This unit focuses on the nervous system and the endocrine system. The basic functional unit of the nervous system, the neuron, is introduced in this chapter. In addition, the nervous system as the master controlling and communicating system of the body is discussed. The neuron functions of communication, information processing and control of the nervous system are considered. The supporting cells, blood vessels and connective tissue that form the organs of the nervous system: brain; spinal cord: receptors; sense organs and nerves that link the nervous system with other body systems are studied. The second control system of the body is the endocrine system. The concept that the endocrine system controls metabolic activities by chemical messengers called hormones is introduced. Finally, integration of these two systems and their control of many physiological activities of the body is reviewed.

Unit Duration: 5 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- The nervous system has anatomical and functional divisions
- Neurons are nerve cells specialized for intercellular communication
- The CNS and PNS neuroglia support and protect neurons
- An action potential is an electrical event
- Neurotransmitters and neuromodulators have various functions
- Individual neurons process information by integrating excitatory and inhibitory stimuli
- The brain and spinal cord make up the central nervous system
- The cranial nerves and spinal nerves constitute the peripheral nervous system
- Reflexes are rapid, automatic responses to stimuli
- The brain can affect spinal cord-based reflexes
- The brain has several principal structures, each with specific functions
- Sensory receptors connect our internal and external environments with the nervous system
- The autonomic nervous system is involved in the unconscious regulation of visceral

Essential Questions:

- What are the anatomical divisions of the nervous system and how does each of these divisions function?
- What are the specialized cells of the nervous system?
- What is the CNS? What are the functions and components of this anatomical division of the nervous system?
- What is the PNS? What are the functions and components of this anatomical division of the nervous system?
- What is an action potential?
- How does axon diameter and myelin affect action potential propagation speed?
- What communication occurs at a synapse?
- What are neurotransmitters and neuromodulators?
- What is the functional anatomy of the brain and spinal cord?
- What are plexuses?
- What is a reflex arc? What is the functional anatomy of the brain?
- What are the 12 pairs of cranial nerves?
- What is the difference between the sympathetic and parasympathetic nervous systems?

functions and has sympathetic and parasympathetic divisions • Homeostasis is preserved through intercellular communication • The endocrine system regulates physiological processes through the binding of hormones to receptors	• What are the components of the endocrine system? • How does the body use the endocrine system to communicate and maintain homeostasis?

Assessment Evidence

Performance Tasks:
Students will be able to…

1. List basic functions of nervous system
2. Explain structural and functional divisions of nervous system
3. List and identify types of nerve cells and functions of each
4. Define neuron, describe structural components and relate to function
5. Explain importance of myelin sheath and relate to disease
6. Define resting, action, and graded potential
7. Explain how action potentials are generated and propagated along neurons
8. Define neurotransmitter and list several
9. Describe common patterns of neural organization and processing
10. Recognize and identify structures of the central nervous system including regions, lobes, fissures, and ventricles of the brain
11. Correlate lobes of the brain with certain functions
12. Describe how meninges, cerebrospinal fluid, and blood-brain barrier protect CNS
13. Describe gross and microscopic structure of spinal cord
14. Describe the cause, signs and symptoms of stroke, Alzheimer's, Parkinson's, traumatic brain injury, spinal cord trauma, ALS, and polio
16. Distinguish between sensory, motor, and mixed nerves
17. Compare and contrast motor endings of somatic and autonomic nerve fibers
18. Define plexus; name major plexuses
19. Describe general structure of a nerve
20. List pairs of cranial nerves
21. Describe three levels of motor hierarchy
22. Name components of a reflex arc and distinguish between autonomic and somatic reflexes
23. Define autonomic nervous system and explain relationship to peripheral system
24. Compare and contrast the effects of the sympathetic and parasympathetic nervous systems
25. Identify major structures of the eye
26. Trace pathway of light through eye to retina
27. Describe events involved in stimulation of photoreceptors
28. Describe sound conduction pathway from outer ear to temporal cortex
29. Describe location, structure, and afferent pathways of taste and smell receptors
30. Describe some pathologies associated with sense organs
31. Compare and contrast hormonal and neural controls
32. Describe chemical classification of hormones and mechanisms of their effect on target

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 12: Neurons and Cell Types
- Quiz Chapter 13: Spinal Cord and Cranial Nerves
- Quiz Chapter 15: Brain and Protection
- Quiz Chapter 17: The Eye and Ear
- Reflex Activity
- Nervous Tissue Lab
- Mouse Party Activity
- Sheep Brain Dissection
- Sheep Eye Dissection

33. Locate major endocrine glands and list function of each and hormones released 34. Describe some endocrine pathologies	

Benchmarks: Unit 5 (Chapters 12 to 17) Test

Learning Plan

Learning Activities:

Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 12 to 17; Dissection of brain and sheep eye; Memory, reflex and special senses activities and independent work on the endocrine system.

Lecture Topics:

- Introduction to Body Control
- Anatomy of the Neuron
- Classifications and Functions of Neurons
- Synapses/Neurotransmitters
- Reflexes
- Special Senses
- Diseases of the Nervous System
- Endocrine Anatomy Review
- Endocrine Function and Physiology

Textbook:

- Martini: Chapter 12, pages 389 to 427
- Marini: Chapter 13, pages 433 to 460
- Martini: Chapter 14, pages 465 to 486
- Martini: Chapter 15, pages 512 to 527
- Martini: Chapter 16, pages 535 to 558
- Martini: Chapter 17, pages 565 to 592
- Martini: Chapter 18, pages 610 o 647

Laboratory Exercises:

- Mouse Party Lab
- Brain Dissection
- Sleep/Memory Activity
- Reflex Lab
- Sheep Eye Dissection
- Concussion Activity and Essay
- Endocrine Activity

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- A&P Flix
    - Resting Membrane Potential
    - Generation of Action Potential
    - Propagation of an Action Potential
- Animations
- MP3 Tutor Sessions

- Flashcards

Interactive Physiology

- The Membrane Potential
- Ion Channels
- The Action Potential
- Synaptic Transmission
- Synaptic Potentials and Cellular Integration
- Orientation to the Endocrine System
- Endocrine System Review
- Biochemistry, Secretion, and Transport of Hormones
- The Actions of Hormones on Target Cells
- The Hypothalamic-Pituitary Axis
- Response to Stress

Case Study:

- Did President Franklin D. Roosevelt Really Have Polio? (Poliomyelitis)
- Prom Night (Paralysis)
- The Neuroanatomist's Stroke (Stroke)
- Living with Cerebral Palsy (Cerebral Palsy)
- Remember Me? (Alzheimer's)
- A Chance to See (Myopia)
- Stones, Bones and Groans (Parathyroid Hormone)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 12 to 18
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Various video and anatomical tutorials in Interactive Physiology at www.masteringaandp.com.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: generation of an Action Potential, membrane potential, ion channels, synaptic transmission, synaptic potentials and cellular integration, peripheral distribution of spinal nerves, somatic sensory pathways,
- Clinical Notes, including but not limited to: rabies, tumors, demyelination, anesthesia, shingles, epidural and subdural hemorrhages, disconnection syndrome, aphasia and dyslexia, assessment of tactile sensitivities, cerebral palsy, amyotrophic lateral sclerosis, anencephaly, amnesias, Alzheimer's disease and categorizing nervous system disorders
- Vernier: Neuromuscular Reflexes Lab
- Various classroom models of basic neurons, brain/brain structures, eye and ear

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Model how the sympathetic and parasympathetic nervous system collect information and make changes to keep the body within normal physiologic ranges.
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the difference between sympathetic and parasympathetic nervous systems • Model the different pathways for information in and out of nervous system including the special senses such as vision, hearing and taste.
2.0	**Students will be able to:** • Recall specific vocabulary including: anesthetic, degeneration, demyelination, dysthymia, excitotoxicity, hemorrhage, hematoma, microglia, neuroblastoma, neuropathy, neurotoxin, tumor • Identify the following muscular diseases: Aphasia, Diphtheria, Dyslexia, Multiple sclerosis Gullian-Barre' Syndrome, Tay-Sachs disease. • Realize the general characteristics of the autonomic, parasympathetic and sympathetic nervous systems.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Model the steps of neuron communication, showing how the specific structures of the neuron allow the process to happen.
3.0	**Students will be able to:** In addition to 2.0 performance: • List the steps of creating a nerve impulse • Describe how a nerve cell generates and propagates a nerve impulse • Explain the specific role the nissel bodies, axon, terminal bulbs, dendrites, neurotransmitters, synaptic cleft • Identify and explain the role of the following: serotonin, dopamine, acetylcholine
2.0	**Students will be able to:** • Recall specific vocabulary including: action potential, adrenergic, autonomic nervous system, axon, central nervous system, cholinergic, convergence, dendrite, divergence, facilitation, myelin, neurilemma, neuroglia, neuron, neurotransmitter, peripheral nervous system, postganglionic, preganglionic, receptor, reflex, summation, sympathetic, synapses, threshold. • Identify the general structure of a neuron • Realize that a nerve impulse is transmitted from one neuron to another
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); HS.PS2.B (HS-LS1-7); HS.PS3.B (HS-LS1-5),(HS-LS1-7)
- Life Science: HS.LS3.A (HS-LS1-1)

Common Core State Standards Connections: ELA /Literacy

- RST .11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- WHST .9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST .9-12.7 Conduct short, as well as, more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST .11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST .9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
- 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.

Common Core State Standards Connections: Mathematics

- MP.4 Model with mathematics.
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- HSF-BF.A.1 Write a function that describes a relationship between two quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 6: Production of Energy for the Body

Unit Description: This unit focuses on the structure and function of the digestive tract, digestive glands and how together this system breaks down food into usable pieces. These nutrients are used as raw materials for synthesizing essential compounds (anabolism). They are also broken down to provide the energy that cells need to continue functioning (catabolism); these activities are explored. In addition, this unit considers how minerals, vitamins and water are absorbed and how organic wastes are removed.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- The digestive system, consisting of the digestive tract and accessory organs, has overlapping food utilization functions
- The oral cavity contains the tongue, salivary glands, and teeth, each with specific functions
- The pharynx is a passageway between the oral cavity and the esophagus
- The stomach is a J-shaped organ that receives the bolus from the esophagus and aids in chemical and mechanical digestion
- The small intestine digests and absorbs nutrients, and associated glandular organs assist with the digestive process
- The large intestine is divided into three parts with regional specialization
- Digestion is the mechanical and chemical alteration of food that allows the absorption and use of nutrients
- Many age-related changes affect digestion and absorption
- The digestive system is extensively integrated with other body systems

Essential Questions:

- What are the organs of the digestive system and how do they function?
- What are the accessory organs of the digestive system and what role do they play in the process of digestion?
- What is the function of the mesentery and where is it found?
- What is the components and function of the oral cavity?
- What is the function and physiology of the pharynx?
- What is the function and physiology of the stomach?
- What is the function and physiology of the small intestine?
- What is the function and physiology of the large intestine?
- What is the process of mechanical and chemical digestion?
- How are nutrients absorbed and utilized in the body?
- What are the diseases and disorders of the digestive system?
- How does the digestive system integrate with other body systems?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Describe functions of digestive system

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities

2. Name and identify organs of alimentary canal; distinguish accessory organs from those of alimentary canal 3. Describe basic function of each organ and accessory organ 4. Describe tissue composition and function of each of four layers of alimentary canal 5. Describe mechanisms of chewing and swallowing 6. Describe function and composition of saliva 7. Identify structural modifications of stomach and small intestine that enhance digestion 8. Describe function and composition of gastric juice and regulation of secretion 9. Describe function and composition of bile and pancreatic juice; describe regulation of 10. List major function of large intestine and describe regulation of defecation 11. List enzymes involved in chemical digestion, food upon which they act, and breakdown products 12. Describe process of absorption of digested food that occurs in small intestine 13. Define nutrient, essential nutrient, and calorie 14. List six major nutrients; sources of each; and main cellular uses 15. List vitamins and minerals essential for health; sources; how used by body 16. Define metabolism and basal metabolic rate or BMR 17. Calculate BMR using computer 18. Describe in general processes by which major nutrients are metabolized 19. Describe several metabolic functions of the liver 20. Explain what is meant by body energy balance 21. Describe some current theories about food intake regulation 22. Compare and contrast ulcers, irritable bowel syndrome and GERD 23. Compare hepatitis and cirrhosis 24. Describe symptoms and consequences of anorexia, bulimia, obesity	• Quiz Chapter 24: GI Tract and Micro Anatomy • Quiz Chapter 24: Stomach and Large Intestine • Quiz Chapter 24: Pancreas, Liver and Gall Bladder • Digestive Rounds Case Study • Fetal Pig Dissection Lab • Digestive System Essay

Benchmarks: Unit 6 (Chapter 24) Test, Fetal Pig Practicum

Learning Plan

Learning Activities:

Mastering A&P activities, class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapter 24, dissection of fetal pig and independent work on digestive essay.

Lecture Topics:

- Digestive Anatomy
- Control of Digestion
- Digestion and Absorption
- Diseases of the Digestive System

Textbook:

- Martini: Chapter 24, pages 885 to 932

Laboratory Exercises:

- Digestion Lab
- Fetal Pig Dissection
- Digestive Essay Activity

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- Animations
- MP3 Tutor Sessions
- Flashcards

Interactive Physiology

- Orientation to the Digestive System
- Anatomy Review of the Digestive System
- Control of the Digestive System
- Motility
- Secretion
- Digestion and Absorption

Case Study:

- Ann Unusual Transplant (Clostridium Difficile Colitis)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 24
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Fetal Pig Dissection Resources at https://www.whitman.edu/academics/departments-and-programs/biology/virtual-pig and http://home.apu.edu/~jsimons/Bio101/PigDissectionGuide.htm. Dissection video resources at https://www.youtube.com. Various video and anatomical tutorials in Interactive Physiology at www.masteringaandp.com.
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: Epithelial renewal and repair, regulation of gastric activity, and chemical events in digestion
- Clinical Notes, including but not limited to: Peritonitis, mumps, gastritis and peptic ulcers, pancreatitis, cirrhosis, colorectal cancer, and inflammatory and infectious disorders of the digestive system.
- Various classroom models of the digestive organs

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Determine anatomic changes and identify a disease of the digestive system, based off a set of given symptoms
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the changes to digestive anatomy that cause the following diseases: diabetes, ulcers, IBS, GERDs, cirrhosis, Crohn's disease, colorectal and pancreatic cancer
2.0	**Students will be able to:** • Recall specific vocabulary including: cathartics, cholelithiasis, cholera, colitis, diverticulitis, diverticulosis, dysphagic, esophageal varices, fecal occult blood test, gastrectomy, gastroscopy, halitosis, insoluble fiber, polyps, pulpitis, pyloric stenosis, pylorospasm, soluble fiber • Recognize several diseases associated with the digestive system. • Identify symptoms of disease in the digestive system.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Demonstrate the pathway for the digestion and absorption of carbohydrates, proteins and lipids from ingestion until the nutrients reach the blood stream
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the breakdown of carbohydrates to glucose • Explain the breakdown of proteins to amino acids • Explain the breakdown of lipids to micelles • Identify the three pathways for adsorption of molecules • Describe how food is mechanically broken down • List and describe the function of the main digestive enzymes
2.0	**Students will be able to:** • Recall specific vocabulary including: absorption, accessory organ, alimentary canal, bile, chyme, circular muscle, deciduous, feces, gastric juice, intestinal juice, intrinsic, longitudinal muscle, mesentery, mucous membrane, pancreatic juice, peristalsis, serous layer, sphincter muscle, villus. • Recognize the organs and accessory structures of the digestive system • Explain the basics of digestion and absorption
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
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Unit Modifications for Special Population Students	
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- WHST .11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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Common Core State Standards Connections: Mathematics

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- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- HSF-BF.A.1 Write a function that describes a relationship between two quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 7: Supply of Oxygen for the Body

Unit Description: This unit focuses on the respiratory system, how it is responsible for getting oxygen into the blood and carbon dioxide out of the blood. It also highlights the link between respiration and the cardiovascular system, with heart rate and respiration rate closely linked to many systemic functions. In addition, this chapter also explores how the respiratory system has a significant role in controlling blood pH.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- The respiratory system, organized into an upper respiratory and a lower respiratory system, has several basic functions
- Located outside the thoracic cavity, the upper respiratory system consists of the nose, nasal cavity, paranasal sinuses, and pharynx
- Composed of cartilages, ligaments, and muscles, the larynx produces sound
- The trachea and primary bronchi convey air to and from the lungs
- Enclosed by a pleural membrane, the lungs are paired organs containing alveoli, which permit gaseous exchange
- External respiration and internal respiration allow gaseous exchange within the body
- Pulmonary ventilation involves pressure changes, muscle movement, and respiratory rates and volumes
- Gas exchange depends on the partial pressures of gases and the diffusion of molecules
- Most oxygen is transported bound to hemoglobin and carbon dioxide is transported in three ways; as carbonic acid, bound to hemoglobin, or dissolved in plasma
- Neurons in the medulla oblongata and pons, along with respiratory reflexes, control respiration
- Respiratory performance declines with age
- The respiratory system provides oxygen to, and eliminates carbon dioxide from, other organ systems

Essential Questions:

- How is the respiratory system organized?
- What are the functions of the respiratory system?
- What is the respiratory mucosa?
- What are the anatomical components of the upper respiratory system?
- What are the anatomical components of the lower respiratory system?
- How is air conveyed to and from the lungs?
- How is gaseous exchange to and from the lungs achieved?
- How is oxygen transported in the body?
- How is carbon dioxide transported in the body?
- What is the role of the nervous system in respiration?
- What affects does age have on the respiratory system?
- How is the respiratory system integrated with other organ systems?

Assessment Evidence

Performance Tasks:
Students will be able to…

1. Name and identify the organs of the respiratory tract in descending order
2. List and describe some protective mechanisms of the respiratory tract
3. Describe the structure and function of alveoli and observe microscopically
4. Relate Boyle's law to the events of inspiration and expiration
5. Explain and compare various lung volumes and indicate information that can be obtained from such measurements
6. Compare and contrast the composition of alveolar and atmospheric air
7. Relate Dalton's law of partial pressures to events of external and internal respiration
8. Describe how oxygen is transported by the blood and list factors that affect loading and unloading
9. Describe how carbon dioxide is transported
10. Describe neural controls of respiration
11. List and describe other factors that influence rate and depth of breathing such as levels of carbon dioxide and oxygen and arterial pH
12. List and describe several of the infectious diseases affecting respiration from the common cold to tuberculosis
13. Describe other lung diseases like COPD, and lung cancer

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 23: Respiratory Anatomy
- Quiz Chapter 23: Ventilation
- Spirometry Lab
- Fetal Pig Dissection Lab

Benchmarks: Unit 7 (Chapter 23) Test, Fetal Pig Practicum

Learning Plan

Learning Activities:

Mastering A&P activities, class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapter 23, Practicum on Fetal Pig Dissection, and Spirometry Lab

Lecture Topics:

- Respiratory Anatomy
- Ventilation
- Gas Exchange and Oxygen Transport
- Internal and External Respiration
- Blood pH
- Control of Breathing

Textbook:

- Martini: Chapter 23, pages 834 to 877

Laboratory Exercises:

- Spirometry Lab
- Fetal Pig Dissection

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- Animations
- MP3 Tutor Sessions
- Flashcards

Interactive Physiology

- Anatomy Review: Respiratory Structures
- Pulmonary Ventilation
- Gas Transport
- Gas Exchange
- Control of Respiration

Case Study:

- No Rest for the Weary (Obstructive Sleep Apnea)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapter 23
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Online Resources: Fetal Pig Dissection Resources at https://www.whitman.edu/academics/departments-and-programs/biology/virtual-pig and http://home.apu.edu/~jsimons/Bio101/PigDissectionGuide.htm. Dissection video resources at https://www.youtube.com. Various video and anatomical tutorials in Interactive Physiology at www.masteringaandp.com. The virtual autopsy at https://www.le.ac.uk/pa/teach/va/anatomy/frmst.html and the InnerBody at http://www.innerbody.com/anatomy/respiratory
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: breakdown of the respiratory defense system, blood gas analysis and control of respiration
- Clinical Notes, including but not limited to: pneumothorax, decompression sickness, carbon monoxide poisoning, emphysema and lung cancer
- Various classroom models of the lungs and alveoli
- Vernier: Experiment 19 Lung Volumes and Capacities

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Model how changes to respiratory rate affect the carbonic acid buffer system and keeps blood pH relatively constant.
3.0	**Students will be able to:** In addition to 2.0 performance: • Explain the how LeChatlier's principle applies to the blood pH buffer • Identify the key components of the blood pH buffering system • Describe how respiratory rate affects the pH of blood • Describe the structures of blood that enable it to carry oxygen and carbon dioxide
2.0	**Students will be able to:** • Recall specific vocabulary including: acid, acidosis, alkalosis, base, bicarbonate, buffer, carbonic acid, homeostasis, pH, • Realize that blood pH is related to respiratory rate
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Create a map or diagram explaining how oxygen is carried to the tissues of the body and how cellular wastes (carbon dioxide) leaves the body
3.0	**Students will be able to:** In addition to 2.0 performance: • Describe the respiratory membrane and its function • Describe the changes to thoracic cavity volume that allow air to come in and out of the body • Describe the structures of blood that allow it to carry oxygen and carbon dioxide • Explain the difference between the conduction and respiratory zones on the respiratory system
2.0	**Students will be able to:** • Recall specific vocabulary including: alveolus, bronchial tree, carbaminohemoglobin, carbonic anhydrase, cellular respiration, citric acid cycle, expiration, glottis, hemoglobin, hyperventilation, inspiration, oxyhemoglobin, partial pressure, pleural cavity, respiratory center, respiratory membrane, respiratory volume, surface tension, surfactant • List the general functions of the respiratory system • Name and describe the locations of the organs of the respiratory system
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
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Unit Title: Unit 8: Circulation of the Body

Unit Description: This unit focuses on the cardiovascular system and blood. It explores how the components of the cardiovascular system accomplish the task of carrying oxygen, carbon dioxide and nutrients around the body. In addition, the heart and blood vessels and how they play an integral part in maintaining pressure and circulating blood through the body will be discussed.

Unit Duration: 4 weeks

Desired Results

Standard(s):

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS- LS1-2)
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Indicators: Structure and Function (LS1A)

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Understandings:

Students will understand that…

- Blood has several important functions and unique physical characteristics
- Plasma, the fluid portion of blood, contains significant quantities of plasma proteins
- Red blood cells contain hemoglobin that can be recycled
- The ABO blood types and Rh system are based on antigen-antibody responses
- The various types of white blood cells contribute to the body's defenses
- Platelets function in the clotting process
- The heart is a four-chambered organ that pumps oxygen-poor blood to the lungs and oxygen-rich blood to the rest of the body
- The conducting system distributes electrical impulses through the heart, and an electrocardiogram records the associated electrical events
- Events during a complete heartbeat constitute a cardiac cycle
- Arteries, arterioles, capillaries, venules, and veins differ in size, structure, and functional properties
- Pressure and resistance determine blood flow and affect rates of capillary exchange
- Cardiovascular regulatory mechanisms involve autoregulation, neural mechanisms, and endocrine responses
- The cardiovascular system adapts to physiological stress and maintains a special vascular supply to the brain, heart, and lungs

Essential Questions:

- What are the functions and characteristics of blood?
- What is blood and what is it composed of?
- What are red blood cells and how do they function?
- What are the ABO blood types and how does the immune system and immune response play a role in this system?
- What are the functions and components of white blood cells?
- What are the functions of platelets
- What is the anatomy of the heart?
- How does the heart pump oxygen-rich and oxygen-poor blood throughout the body?
- What is the electrical conducting system of the heart?
- What is the cardiac cycle?
- What the relative sizes, structure and functional properties of arteries, arterioles, venules and veins?
- How are pressure and resistance related to blood flow rates and capillary exchange?
- How is the cardiovascular system regulated?
- How does the cardiovascular system adapt to stress?
- How does age affect the cardiovascular system?

- Aging affects the blood, heart, and blood vessels

Assessment Evidence

Performance Tasks:

Students will be able to…

1. List and identify the components of whole blood
2. Describe composition and function of plasma
3. Discuss structure, function and production of red blood cells
4. Identify types of leukocytes
5. Explain how hemoglobin carries oxygen
6. Describe the basic steps of blood clot formation
7. Describe the ABO and Rh blood groups and explain basis of transfusion reactions
8. Describe changes in blood in disorders such as anemia, sickle cell anemia, and leukemia
9. Name several common blood tests and what the tests diagnose.
10. Identify and name major characteristics of heart
11. Name the coverings of the heart and describe pathology of pericarditis
12. Describe structure and function of three layers of the heart
13. Identify four chambers of the heart and great vessels associated with them and list functions of each
14. List the heart valves and describe the function of a valve
15. Identify heart sounds of valves and describe a heart murmur.
16. Compare and contrast cardiac muscle and skeletal muscle
17. Follow the path of a red blood cell from the superior vena cava through the heart and out to tissue and back to inferior vena cava
18. Name and locate some of the coronary arteries and understand how blockage of coronary arteries causes heart disease and heart attack
19. Name components of conduction system, especially SA node and trace conduction pathway
20. Observe an ECG tracing and name and identify P, QRS, T waves and correlate to cardiac cycle
21. Describe the timing and events of the cardiac cycle
22. Describe some heart pathologies, especially heart attack
23. Identify layers that typically form walls of vessels and state function of each
24. Compare and contrast the different types of arteries
25. Identify on drawing the major veins and arteries of the human body
26. Explain how veins differ from arteries
27. Describe structure and function of capillary bed and list some factors involved in capillary blood flow
28. Define low, normal, and high blood pressure
29. List and explain the factors that influence blood pressure and how blood pressure is regulated

Other Evidence:

- Independent Work
- Class Discussions
- Online Activities
- Quiz Chapter 19: Blood
- Quiz Chapter 20: Heart Anatomy
- Quiz Chapter 21: Vessel Anatomy
- Quiz: Cardiac Cycle
- Heart Dissection Lab
- Blood Pressure Lab
- ECG Lab
- Live Open Heart Surgery/Activities

30. Define hypertension and discuss consequences of untreated hypertension	

Benchmarks: Unit 8 (Chapters 19 to 21) Test, Heart Dissection

Learning Plan

Learning Activities:

Mastering A&P activities**,** class discussions and cases studies, InterActive Physiologies (available through masteringaandp.com) that coincide with Chapters 19 to 21, Heart Dissection Lab, Blood Pressure and ECG Lab.

Lecture Topics:

- Blood Pressure and Vessels
- Heart Structure
- Heart Valves
- Heart Conduction System and Cardiac Cycle
- Regulation of Heart Beat
- Diseases of the Cardiovascular System

Textbook:

- Martini: Chapter 19, pages 292 to 329
- Marini: Chapter 20, pages 336 to 383

Laboratory Exercises:

- Blood Pressure Lab
- Heart Dissection
- ECG Lab
- Open Heart Surgery Activity

Mastering A & P:

- Chapter Guides
- Chapter Quizzes
- Practice Tests
- Labeling Activities
- Animations
- MP3 Tutor Sessions
- Flashcards

Interactive Physiology

- Anatomy Review: The Heart
- Intrinsic Conduction System
- Cardiac Action Potential
- Cardiac Cycle
- Cardiac Output
- Anatomy Review: Blood Vessel Structure and Function
- Measuring Blood Pressure
- Factors that Affect Blood Pressure
- Blood Pressure Regulation
- Autoregulation and Capillary Dynamics

Case Study:

- Crisis in the Blood (Sickle Cell Disease)
- A Needle to the Chest (Pericardiocentesis)
- Did Ancient Mummies have Atherosclerosis? (Atherosclerosis and CT Scans)

Resources:

- Textbook: Fundamentals of Anatomy and Physiology 11th ed. by Martini, Nath and Bartholomew Chapters 19 to 21
- Mastering A&P at www.masteringaandp.com. This online component has chapter guides, chapter quizzes, practice tests, labeling activities, APFlix, animations, MP3 tutor sessions, flashcards and a glossary.
- Online Resources: Various Videos on ECG, Blood Flow and Blood Typing at www.youtube.com, Cardiovascular anatomy and physiology from Texas Heart Institute at http://www.texasheart.org/HIC/Anatomy/ and from InnerBody at http://www.innerbody.com/image/cardov.html
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops.
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information) in conjunction with, but not limited to the following topics: blood analysis and collecting, the composition of whole blood, hemoglobin, the cardiac cycle and ECG technology
- Clinical Notes, including but not limited to: arteriosclerosis, edema, congenital heart problems, heart disease and heart attacks, cardiac arrhythmias, hemolytic diseases of the newborn, abnormal hemoglobin
- Various classroom models of the heart and ECG tracings
- Vernier: Experiment 12 Analyzing the Heart with EKG; Experiment 7 Blood Pressure as a Vital Sign

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
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4.0	**Students will be able to:** In addition to 3.0 performance: • Interpret and diagram how blood pressure is generated, maintained and controlled in the body
3.0	**Students will be able to:** In addition to 2.0 performance: • Describe the differences between arties and veins • Explain why the heart wall has difference thicknesses in certain areas • Explain the relationship between flow rate, pressure and vessel diameter
2.0	**Students will be able to:** • Recall specific vocabulary including: aortic sinus, arrhythmias, atrial baroreceptors, atrial reflex, autoregulation, baroreceptors, cardiovascular centers, carotid sinus, central regulation, chemoreceptors, vasodilation, vasoconstriction, • List the components of the blood pressure regulation system.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): Systems of specialized cells within organisms help them perform the essential functions of life.	
4.0	**Students will be able to:** In addition to 3.0 performance: • Translate specific electrical events of the heart cycle from an ECG, relating them to specific anatomical features of the heart tissue that allow for the continual pumping of blood throughout the body
3.0	**Students will be able to:** In addition to 2.0 performance: • Discuss the functions of the major components of the heart • Trace the pathway of the blood through the heart • Describe coronary circulation and identify the vessels involved • Compare the pulmonary and systemic circuits of the cardiovascular system
2.0	**Students will be able to:** • Recall specific vocabulary including: arteriole, atrium, cardiac conduction system, cardiac cycle, cardiac output, diastole, electrocardiogram, endocardium, epicardium, functional syncytium, myocardium, pacemaker, pericardium, peripheral resistance, pulmonary circuit, sphygmomanometer, systemic circuit, systole, vasoconstriction, vasodilation, ventricle, venule, viscosity • Name the organs of the cardiovascular system and discuss their functions • Name and describe the locations of the major parts of the heart
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