

TOMS RIVER REGIONAL SCHOOLS SCIENCE CURRICULUM
Anatomy/Physiology Curriculum

Content Area: Anatomy/Physiology: Honors

Course Title: Anatomy/Physiology: Honors

Grade Level: High School

Unit 1:
Body Organization
Cell Chemistry
Histology

Marking Period: 1
 Body Organization: 15 days
 Cell Chemistry: 15 days
 Histology: 15 days

Unit 2:
Integumentary System
Skeletal System
Cardiovascular System

Marking Period: 2
 Integumentary System: 15 days
 Skeletal System: 15 days
 Cardiovascular System: 15 days

Unit 3:
Muscular System
Nervous System
Respiratory System

Marking Period: 3
 Muscular System: 15 days
 Nervous System: 15 days
 Respiratory System: 15 days

Unit 4:
Digestive System
Urinary System
Reproductive System

Marking Period: 4
 Digestive System: 15 days
 Urinary System: 15 days
 Reproductive System: 15 days

Date Created:

July 2019

Board Approved on: 8-21-2019

TOMS RIVER REGIONAL SCHOOLS SCIENCE CURRICULUM

Body Organization, Cell Chemistry, and Histology

Body Organization: 15 days

Cell Chemistry: 15 days

Histology: 15 days

Content Area: Anatomy/Physiology

Unit Title: Body Organization, Cell Chemistry, and Histology

Target Course/Grade Level: High School

Unit Summary

“Anatomy and physiology are the studies of the components of the body and how they work together. The human body is a complex system, consisting of many levels of organization. This organization begins with chemistry that makes life possible and continues through cells, tissues, organs, and organ systems. Understanding the structure of these levels of organization is key to understanding their functions.”

Cross-Cutting Concepts:

- **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
- **Systems and System Models:** Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales.
- **Energy and Matter:** Energy cannot be created or destroyed; it only moves between one place and another place, between objects and/or fields, or between systems.

Disciplinary Core Idea:

- **Stability and Change:** 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.

- **Structure and Function:** Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- **Growth and Development of Organisms:** In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
- **Organization for Matter and Energy Flow in Organisms:** As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

Science and Engineering Practices:

- **Planning and Carrying Out Investigations:** Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematics.
- **Developing and Using Models:** Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

For further clarification refer to the Next Generation Science Standards:

<https://www.nextgenscience.org/get-to-know>

Learning Targets

Content Standards

CONTENT STANDARDS LINK: <https://www.nextgenscience.org/get-to-know>

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

HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4	Use a model to illustrate the role of cellular division and differentiation.
HS-LS1-7	Illustrate that cell respiration is a chemical process whereby bonds are broken and formed to create energy.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.3:	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.5:	Assess and modify a personal plan to support current interests and postsecondary plans.
Interdisciplinary Practices	
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)
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. (HS-LS1-3)
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. (HS-LS1-3)
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4)
HSF-BF.A.1	Write a function that describes a relationship between two

quantities. (HS-LS1-4)

Unit Essential Questions

- How is the human body organized?
- How do cells maintain balance within the human body?
- How does the specificity of a tissue affect the overall organ function in the human body?
- Why are cells called the structural unit of life?
- How does the cell's structure allow it to be selectively permeable?
- What is the difference between passive and active transport?
- What are the types of passive and active transport called?
- How do intracellular fluid differ from extracellular fluid?
- How is cell transport affected by intracellular and extracellular concentrations?
- What is meant by 'cell differentiation'?
- What are stem cells and where in the body can they be

Unit Enduring Understanding

Students will understand that...

- Anatomy is the study of the structures of the body and physiology is the study of the processes and functions of the body.
- The function of the human body systems is to maintain constant internal homeostasis.
- All systems of the human body are independent in their function as well as interdependent for the body's overall well-being.
- Cells are the structural unit of life, containing organelles, which perform specific functions.
- The plasma membrane's structure causes the cell to be selectively permeable, allowing only certain substances to pass.
- Movement across the plasma membrane consists of passive and active types of transport.
- Intracellular fluid is different from extracellular fluid because the plasma membrane regulates the movement of materials.
- The difference between intracellular and extracellular fluid concentrations determine water movement.
- Differentiation is the process by which cells develop structures and functions, resulting from the selective activation and inactivation of genes.
- Stem cells are unspecialized cells that have the ability to divide indefinitely and give rise to specialized cells.
- Stem cells are classified as either omnipotent, pluripotent, and multipotent.
- Cells are organized into structures called tissues.
- All organs are composed of four tissue types.
- Each tissue's function is directly related to its structure to maintain homeostasis.
- Cellular changes occur as humans age and these changes can affect tissue structure and function.

<p>found?</p> <ul style="list-style-type: none"> - How are omnipotent, pluripotent, and multipotent stem cells different? - How are cells organized into tissues? - What are the four tissue types and how do they differ? - How does tissue structure relate to its function in order to maintain homeostasis? 	
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> ● The relationship between anatomy and physiology and some specialties of each discipline. ● The major levels of organization in the human body ● The 11 major organ systems and their components. ● The meaning and importance of homeostasis in the human body. ● The role of negative feedback and homeostatic regulations. ● The importance of using correct anatomical terms in 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> ● Explain the relationship between anatomy and physiology and describe various specialties of each discipline. ● Identify the major levels of organization in the human body. ● Identify the 11 major organ systems of the human body and the major components of each. ● Illustrate with examples of how each system is interdependent in their function. ● Explain the concept of homeostasis and its importance in the human body. ● Explain how cells are called the structural unit of life. ● Explain the functions of lysosomes, nucleus, mitochondria, and ribosomes. ● Describe the structure of the plasma membrane and how materials move across the membrane. ● Describe the differences between osmosis, diffusion, and active transport the material moved by each process. ● List the most important ions in the intracellular and extracellular fluid that affect movement across the cell. ● Describe cell differentiation and provide examples of this process in specific cells. ● Explain the difference between omnipotent, multipotent,

describing sections, regions, and relative positions of the human body.

- That cells are the structural unit of all living things.
- That cells have structures called organelles which perform specific functions for the cell.
- That all cells have a selectively permeable membrane, with its structure dictating what moves in and out of the cell.
- That material can move across the cell membrane by diffusion, osmosis, and active transport.
- The difference between intracellular and extracellular fluid.
- That cell transport depends on the concentration of specific ions and organic molecules inside and outside of the cell.
- What cell differentiation is and how it is controlled.
- That stem cells that always divide, giving rise to specific specialized

and pluripotent stem cells and provide examples of each type of stem cell.

- Describe the areas of the body where stem cells are found.
- Identify the body's four basic tissue types and describe their role.
- Discuss the types and functions of epithelial cells.
- Describe the relationship between form and function of each type of epithelium.
- Compare the structures and functions of the various types of connective tissues.
- Describe the three types of muscular tissue and the distinctive structural features of each.
- Explain the physiological effects of some tissue disorders.

cells in specific parts of the human body.

- The four basic types and their role in the human body.
- The different types of epithelial cells and their functions.
- The relationship between the form and function of each type epithelium.
- The structure and functions of each type of connective tissue.
- Some disorders that affect the different types of tissues of the body, such as scleroderma, sarcoma, and carcinoma.

TOMS RIVER REGIONAL SCHOOLS SCIENCE CURRICULUM
Evidence of Learning

Formative Assessments

- Observations
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- Do-Now
- Laboratories/Lab Reports
- Notebooks
- Writing Assignments

Summative Assessments

- Chapter/Unit Test
- Writing Assignments

- Presentations
- Laboratory Practical
 - Mid-Term and Final Exams

Benchmark

- New Jersey Student Learning Assessment: Science (NJSLA)
- Quarterly Exams
- Unit Test
- Performance Assessment

Alternative

- Oral Presentation
- Video Recording
- Virtual Lab

Modifications (ELLs, Special Education, Gifted and Talented)

ELL:

- Audiobooks, Movies, and other digital media in lieu of print versions
- Native language tests and native language English Dictionary

Special Education/504:

- Response to Intervention (RTI)
- Follow all IEP modifications/504 plan
- Oral Instructions
- Record lessons instead of taking notes
- Outline of lessons
- Study guide with answers
- Word Processor to type notes
- Frequent breaks

Gifted and Talented:

- Peer Tutoring
- Cooperative learning groups
- Differentiated instruction

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Online Resources
- Laboratory manuals and equipment
- NJ DOE Model Curriculum Resources:

Teacher Notes:

TOMS RIVER REGIONAL SCHOOLS SCIENCE CURRICULUM

Integumentary System, Skeletal System, and Cardiovascular System

Integumentary System: 15 days

Skeletal System: 15 days

Cardiovascular System: 15 days

Content Area: Anatomy & Physiology

Unit Title: Integumentary System, Skeletal System, and Cardiovascular System

Target Course/Grade Level: High School

Unit Summary

“ The previous unit took you through the organizational levels of atoms, molecules, cells, and tissues. The remaining units in this course will focus on organs and organ systems, and how these systems interact to carry out the functions of life. The integumentary, skeletal, and cardiovascular system are responsible for the movement and support of the body. This unit will introduce you how skin, bone, and muscle allow the human body to hold together and move through the world.”

Cross-Cutting Concepts:

- **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
- **Systems and System Models:** Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales.
- **Energy and Matter:** Energy cannot be created or destroyed; it only moves between one place and another place, between objects and/or fields, or between systems.

Disciplinary Core Idea:

- **Stability and Change:** 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.
- **Structure and Function:** Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- **Growth and Development of Organisms:** In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each

chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

Science and Engineering Practices:

- Planning and Carrying Out Investigations: Planning and carrying out investigations in 9- 12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematics.
- Developing and Using Models: Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

For further clarification refer to the Next Generation Science Standards:

<https://www.nextgenscience.org/get-to-know>

Learning Targets

Content Standards

CONTENT STANDARDS LINK: <https://www.nextgenscience.org/get-to-know>

DCI	Strand
HS-LS-1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.3:	Investigate how continuing education contributes to one’s career and personal growth.
9.2.12.CAP.5:	Assess and modify a personal plan to support current interests and postsecondary plans.

Interdisciplinary Practices

SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)
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. (HS-LS1-3)
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. (HS-LS1-3)
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4)
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)
Unit Essential Questions - How do the structures of the skin help to regulate other parts of the human body? -How is the skeleton used in movement and support within the human body? -What is the function of the heart, and vessels, and how do they maintain a healthy body? -What are the functions of the skin and its derivatives? - How are the body systems dependent on the normal functioning of the integumentary system? -How does the integumentary system maintain homeostasis between the internal and external environment? -What are the four	Unit Enduring Understandings <i>Students will understand that...</i> -The skin and its derivatives make up a complex set of organs that serve various functions. -All of the body systems are dependent on the normal functioning of the integumentary system. -The integumentary system plays a large role in maintaining homeostasis by protecting the internal structures from the external environment. -The skeletal system consists of bones, cartilage, tendons, and ligaments. -Bone tissue contains various specialized cells that each contribute to the homeostasis of the skeletal system. -Bone cells have specific structures and functions. -There are four main types of bones, each with a particular structure and function. -Bone development of spongy bone differs from that of compact bone. -Bone growth can occur by longitudinal and appositional growth. - Changes in bone tissue occur as the human body ages. -The physiology of the skeletal system maintains homeostasis by playing an important role in regulating calcium levels, bone remodeling and repair and providing a protective site for hematopoiesis.

components of the skeletal system?

-What are the specific cells of bone tissue and what role does each play in the homeostasis of the skeletal system?

-How does the structure of the different bone cells contribute to their function?

-What are the four main types of bones and how do they differ in their structure and function?

-How does bone development in spongy bone differ from that of compact bone?

- How does longitudinal bone growth differ from appositional growth?

-What are some changes that occur in bone tissue as a person ages?

- How do the axial and appendicular bones join together to create a framework that supports the weight of the human body? -

How do the functions differ in the appendicular and axial skeleton?

-What is meant by a "bone marking" and what are some of their functions?

-How is homeostasis maintained by the various roles of the skeletal system?

-How do the organs of the cardiovascular system maintain homeostasis?

-Why does blood need to

-The anatomy of the skeleton provides the framework for the human body and is composed of the axial and appendicular bones.

-The bones of the appendicular skeleton have different functions than the bones of the axial skeleton.

-The bones of the appendicular and axial skeleton have distinct bone markings with specific functions.

-To maintain homeostasis, the organs of the cardiovascular system work together to keep blood continuously flowing to all cells of the body.

-Blood flows in one direction. Blood provides the means by which the cells of the body receive the essential nutrients and oxygen and dispose of cellular waste.

-Blood provides both a regulatory and protective function for the body.

-To maintain homeostasis, the organs of the cardiovascular system work together to keep blood continuously flowing to all cells of the body.

-Blood normally flows in one direction through the chambers and valves of the heart.

-Electrical signals flow through the heart to control its contractions, so to maintain a steady flow of blood.

-Blood flows through an extensive vascular network to reach all the cells of the body.

-This vascular network is composed of dynamic structures that rapidly alter the blood flow in response to changing internal and external conditions.

flow in only one direction? -
 How does blood, with the aid of the other organs of the cardiovascular system, provide cells with the essential nutrients and oxygen and rid the cells of waste?
 - How does blood help protect the body as well as regulating blood levels of particular substances in the body?
 -How do the heart and blood vessels work together to keep blood flowing to all the cells of the body?
 -How are the chambers and valves of the heart organized so that blood only moves in one direction?
 -How do the electrical signals maintain steady contractions of the heart?
 -How is the vascular network organized?
 -How does blood pressure affect the flow of blood through arteries, capillaries and veins?

Unit Objectives

Students will know...

- The functions of the integumentary system, as a whole.
- The tissue types which make up the epidermis and dermis
- The major layers of the epidermis and dermis.
- The functions of each

Unit Objectives

Students will be able to...

- Name the tissue types composing the epidermis and dermis.
- List the major layers of each and describe the functions of each layer.
- Describe the factors that contribute to skin color. · Compare the structure, functions and locations of sweat and oil glands.
- Summarize the characteristics of the three major types of skin cancers.
- Describe how to determine the extent of a burn and

layer of the epidermis and dermis.

- Epidermal pigmentation and dermal circulation which influence skin color.
- The structure, function and location of the sweat and oil glands.
- The characteristics of the three major types of skin cancer.
- How to determine the extent of a burn.
- The difference between a first, second, and third degree burn.
- Serious burns affect many body systems and can be life threatening.
- The causes of changes that occur in the skin from birth to old age.
- The four components of the skeletal system.
- The specific cells that make up the bone tissue and the roles each play in homeostasis of the skeleton.
- That the structure of the different bone cells contribute to their function · the four main types of bones and their

differentiate between first, second, and third degree burns.

- Describe the changes that occur to the integumentary system as the human body ages.
- List the four components of the skeletal system.
- Name the bones that make up the axial and appendicular skeleton.
- Define the different types of bone cells and describe their functions and origins.
- Describe the composition and organization of the bone matrix.
- Identify the bone markings on the bones of the axial and appendicular skeleton.
- Describe the four main types of bones and be able to distinguish between the different types.
- Explain the role of bone in calcium homeostasis.
- Name the two patterns of bone formation and explain how each produces bone.
- Describe the process and requirements of bone growth.
- Describe the process of bone repair, the cells involved and the types of tissue produced.
- Identify the bone markings on the bones of the axial and appendicular skeleton.
- Explain the physiological effects of some disorders of bone
- Collaborate with lab partners to provide explanation and or identification of unknown bones and markings
- Identify a given bone, bone markings and functions of bone and/ or markings with a bone practical.
- Explain how and where blood cells are formed.
- List the functions of the blood.
- Describe the composition and physical characteristics of whole blood.
- Name the substances found in plasma and explain their function.
- Describe how the structure of blood cells determine their function.
- Construct a chart listing the various types of blood cells and their functions.
- List the physical effects of blood cell disorders such as leukemia.
- List and explain the steps involved in blood clotting (hemostasis).

functions.

- Spongy bone in the skeletal system develops differently than that of compact bone.
- Longitudinal bone growth is accomplished by a different process than that of appositional growth.
- Some disorders and conditions of bone in the aging process · how bone remodels and repairs itself in order to maintain homeostasis.
- The bones of the axial and appendicular skeletons connect by ligaments and tendons.
- The bones that make up the axial and appendicular skeleton and how the functions of the appendicular and axial skeletons differ.
- The bone markings associated with the axial and appendicular skeleton.
- The various functions of bone markings.
- The process of hematopoiesis
- The functions of the blood.

- The composition and physical characteristics of whole blood.
- The composition of plasma and their functions.
- The function and structure of the erythrocytes, leukocytes and thrombocytes.
- Example of blood cell disorders.
- The steps of hemostasis.
- The regulatory and protective functions of blood.

TOMS RIVER REGIONAL SCHOOLS SCIENCE CURRICULUM
Evidence of Learning

Formative Assessments

- Observations
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- Do-Now
- Laboratories/Lab Reports
- Notebooks
- Writing Assignments

Summative Assessments

- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Practical
- Mid-Term and Final Exams

Benchmark

- New Jersey Student Learning Assessment:Science (NJSLA)
- Quarterly Exams
- Unit Test
- Performance Assessment

Alternative

- Oral Presentation
- Video Recording
- Virtual Lab

Modifications (ELLs, Special Education, Gifted and Talented)

ELL:

- Audiobooks, Movies, and other digital media in lieu of print versions
- Native language tests and native language English Dictionary

Special Education/504:

- Response to Intervention (RTI)
- Follow all IEP modifications/504 plan
- Oral Instructions
- Record lessons instead of taking notes
- Outline of lessons
- Study guide with answers
- Word Processor to type notes
- Frequent breaks

Gifted and Talented:

- Peer Tutoring
- Cooperative learning groups
- Differentiated instruction

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher

Resources:

- Online Resources
- Laboratory manuals and equipment
- NJ DOE Model Curriculum Resources:

Teacher Notes:

OCEAN COUNTY SCIENCE CURRICULUM
Muscular System, Nervous System, and Respiratory System
Muscular System: 15 days
Nervous System: 15 days
Respiratory System: 15 days

Content Area: Anatomy & Physiology

Unit Title: Muscular System, Nervous System, and Respiratory System

Target Course/Grade Level: High School

Unit Summary:

“The organ systems of the human body are responsible for a multitude of functions. In the previous unit, students studied those organ systems that are responsible for the support and movement of the body. As you likely know, these systems do not work in isolation. In this unit students will study the nervous system, the senses, and the respiratory system.”

Cross-Cutting Concepts:

- **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
- **Systems and System Models:** Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales.
- **Energy and Matter:** Energy cannot be created or destroyed; it only moves between one place and another place, between objects and/or fields, or between systems.

Disciplinary Core Idea:

- **Stability and Change:** 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.
- **Structure and Function:** Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- **Growth and Development of Organisms:** In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
- **Organization for Matter and Energy Flow in Organisms:** As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

Science and Engineering Practices:

- **Planning and Carrying Out Investigations:** Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide

evidence for and test conceptual, mathematics.

- Developing and Using Models: Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds

Technology connections:

For further clarification refer to the Next Generation Science Standards:

<https://www.nextgenscience.org/get-to-know>

Learning Targets

CONTENT STANDARDS LINK:<https://www.nextgenscience.org/get-to-know>

DCI	Strand
HS-LS1-2	Develop and use models to illustrate the hierarchical organization of interacting systems
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.

Career Readiness, Life Literacies, and Key Skills

9.2.12.CAP.3:	Investigate how continuing education contributes to one’s career and personal growth.
9.2.12.CAP.5:	Assess and modify a personal plan to support current interests and postsecondary plans.

Interdisciplinary Practices

SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)
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. (HS-LS1-3)
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. (HS-LS1-3)
MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4)
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)
Unit Essential Questions <ul style="list-style-type: none"> - How does muscle tissue provide for movement, blood flow, and digestion? - What are the three muscle types and explain their structure and function? - How does muscular structure relate to muscle contraction? - How does fiber direction, location, and arrangement aid in the naming of muscles? - What factors can promote muscle fatigue? - What are some examples of muscle mechanisms? - How do the circulatory and respiratory systems work together to deliver oxygen and remove carbon dioxide? 	Unit Enduring Understandings <i>Students will understand that...</i> <ul style="list-style-type: none"> - Movement, blood flow, breathing and digestion cannot occur without muscular tissue. - The three muscle types have a unique structure and function. - Muscular contraction is a complex series of steps in a cascade. - Muscles can be named for their location, fiber direction and arrangement. - Muscle fatigue is linked to several factors including how fuel is broken down in the body. - The principles of muscle mechanics allows for dynamic characteristics of muscle. - The circulatory and respiratory systems obtain and deliver oxygen to body cells and eliminate carbon dioxide from the body. - The respiratory system structures are responsible for gas exchange between the blood and the external environment. - The respiratory system plays an important role in maintaining the acid-base balance of the blood.

<ul style="list-style-type: none"> - How do the respiratory structures function in gas exchange between the blood and the external environment? - How does the respiratory system maintain acid-base balance in blood? - What are some abnormalities of the respiratory system that can result from disease, health habits, and aging? - How does sensation interpretation, response and activity from the nervous system play a role in maintaining homeostasis? - How and why do nerve cells send electrical signals for communication? - What are reflexes and how do they help in protecting our bodies from harm? - What are reflexed and how do they help in protecting our bodies from harm? - How can reflexes be tested? - How do nerves interpret incoming impulses and act with outgoing impulses? - How does the endocrine system maintain an important role in regulating the activity of body cells? 	<ul style="list-style-type: none"> - Homeostatic imbalances can occur as a result of aging, health habits, and disease. - The nervous system maintains body homeostasis through sensation, interpretation, response, and activity. - Nerve cells send electrical signals for communication. - Reflexes help protect our bodies from harm and can be tested. - Nerves interpret incoming impulses and act with outgoing impulses.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> - The structure and function of three types of muscle tissue - Microscopic anatomy of skeletal muscle - The role of actin and 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> - Compare and contrast the structure and function of the three types of muscular tissue and indicate where they are found in the body. - Analyze the macroscopic and microscopic structure of skeletal muscle and explain the role of actin and myosin containing filaments.

myosin in muscle physiology.

- The key steps involved in the contraction of skeletal muscle fiber.
- How muscles are named.
- The similarities of aerobic and anaerobic endurance.
- The difference between an isotonic and isometric contraction.
- Various diseases are associated with muscles of the body.
- The function of each organ in the respiratory system.
- The protective mechanisms of the respiratory system.
- The structure and function of the lungs and pleural coverings.
- The four events in respiration.
- The relationship between volume changes and breathing.
- The different types of respiratory volumes.
- How gas exchange occurs in the lungs and tissues.
- How oxygen and carbon dioxide are transported in the blood.
- Why a person can not voluntarily stop breathing.
- Some of the physical, chemical, and emotional factors that affect respiratory rate.
- The symptoms and causes of the following respiratory diseases: emphysema, chronic bronchitis, and lung

- Explain the key steps involved in the contraction of a skeletal muscle fiber.
- Identify skeletal muscles of the body using criteria.
- Compare and contrast aerobic anaerobic endurance, including muscular fatigue and explain its implications in muscle performance.
- List examples of isometric and isotonic contractions.
- Name the organs in the respiratory passageway, identify them on a diagram and describe the function of each.
- Describe the protective mechanisms of the respiratory system.
- Identify and describe the four events that make up respiration.
- Explain mechanical breathing in terms of volume changes.
- Identify and explain each of the types of respiratory volumes.
- Describe the process of gas exchanges in the lungs and tissues.
- Explain how oxygen and carbon dioxide are transported in the blood.
- Explain why it is not possible to stop breathing voluntarily.
- Identify several physical, chemical, or emotional factors that affect respiratory rate.
- Describe systems and causes of emphysema, chronic bronchitis and lung cancer.
- Explain the physiological effects of respiratory diseases such as emphysema, chronic bronchitis and lung disease.
- Explain the general function of the nervous system.
- Describe the general structure of the neuron and name its important anatomical regions.
- Define a reflex arc and list its elements.
- Explain the types of motor responses produced by various reflexes.
- Explain the function of the various divisions of the nervous system, including the central, peripheral, and autonomic and somatic systems.

- cancer.
- The general functions of the nervous system.
- The general structure of a neuron.
- What a reflex is.
- The functions of the central, peripheral, autonomic and somatic systems.

OCEAN COUNTY SCIENCE CURRICULUM
Evidence of Learning

Formative Assessments

- Observations
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- Do-Now
- Laboratories/Lab Reports
- Notebooks
- Writing Assignments

Summative Assessments

- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Practical
- Mid-Term and Final Exams

Benchmark

- New Jersey Student Learning Assessment: Science (NJSLA)
- Quarterly Exams
- Unit Test
- Performance Assessment

Alternative

- Oral Presentation
- Video Recording

- Virtual Lab

Modifications (ELLs, Special Education, Gifted and Talented)

ELL:

- Audiobooks, Movies, and other digital media in lieu of print versions
- Native language tests and native language English Dictionary

Special Education/504:

- Response to Intervention (RTI)
- Follow all IEP modifications/504 plan
- Oral Instructions
- Record lessons instead of taking notes
- Outline of lessons
- Study guide with answers
- Word Processor to type notes
- Frequent breaks

Gifted and Talented:

- Peer Tutoring
- Cooperative learning groups
- Differentiated instruction

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher

Resources:

- Online Resources
- Laboratory manuals and equipment
- NJ DOE Model Curriculum Resources:

Teacher Notes:

OCEAN COUNTY SCIENCE CURRICULUM
Digestive System, Urinary System. And Reproductive System
Digestive System: 15 days
Urinary System: 15 days
Reproductive System: 15 days

Content Area: Anatomy & Physiology

Unit Title: Digestive System, Urinary System. And Reproductive System

Target Course/Grade Level: High School

Unit Summary:

“The organ system you have studied so far supports and moves the body, and transports substances in the body between organ systems. In this unit, students will focus on the organ systems responsible for maintaining homeostasis by introducing substances into the body and eliminating substances from the body. In addition, students will follow the path of the human life cycle from the production of sperm and oocytes by the male and female reproductive systems, to

fertilization and formation of a zygote, through pregnancy, birth, and aging.”

Cross-Cutting Concepts:

- Stability and Change: Feedback (negative or positive) can stabilize or destabilize a system.
- Systems and System Models: Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales.
- Energy and Matter: Energy cannot be created or destroyed; it only moves between one place and another place, between objects and/or fields, or between systems.

Disciplinary Core Idea:

- Stability and Change: 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.
- Structure and Function: Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Growth and Development of Organisms: In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

Science and Engineering Practices:

- Planning and Carrying Out Investigations: Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematics.
- Developing and Using Models: Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds

Technology connections:

For further clarification refer to the Next Generation Science Standards:

<https://www.nextgenscience.org/get-to-know>

Learning Targets

CONTENT STANDARDS LINK:

DCI	Strand
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4	Use models to illustrate the role of cell division and differentiation.
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.3:	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.5:	Assess and modify a personal plan to support current interests and postsecondary plans.
Interdisciplinary Practices	
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)
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. (HS-LS1-3)
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. (HS-LS1-3)

MP.4	Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4)
HSF-BF.A.1	Write a function that describes a relationship between two quantities. (HS-LS1-4)
<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How does the digestive system break down ingested food into components that are absorbed into the blood? • How do the digestive organs function in food ingestion, digestion, absorption and elimination of undigested remains from the body? • What are some of the causes of declining digestive activity in the aging population? • Why are kidneys important in maintaining homeostasis? • How do kidneys filter wastes from the blood, retain necessary components and excrete wastes in the form of urine? • What other organs of the urinary system act in the storage and transport of urine? • What are some of the disorders that can occur in the urinary system as one ages? • How does the reproductive system provide the means for producing offspring? • What are the primary and accessory reproductive 	<p>Unit Enduring Understandings</p> <p><i>Students will understand that..</i></p> <ul style="list-style-type: none"> • The digestive system breaks down ingested food into components that can be absorbed into the blood. • The digestive organs are responsible for food ingestion, digestion, absorption, and elimination of undigested remains from the body. • The gastrointestinal tract activity declines in aging. • The kidneys are the major homeostatic organs of the body. • The kidneys filter wastes that will leave the body in the form of urine and return necessary components to the blood, retaining internal homeostasis and proper body functioning. • Aside from disposing wastes, the kidneys maintain the electrolyte, acid-base, and fluid balances of the blood. • The other organs of the urinary system serve as either temporary storage for urine or transport channels for urine. • Several changes can occur in urinary system anatomy and physiology with aging. • The biological function of the reproductive system is to provide the means for producing offspring. There are primary and accessory reproductive organs, which become mature at puberty. • Sex hormones play a vital role in the development and function of the reproductive organs. • Sex hormones regulate the female ovarian and menstrual cycles. • The main role of the male reproductive system is to produce sperm and deliver it to the female reproductive tract. • The main role of the female reproductive system is

<p>organs of the male and female?</p> <ul style="list-style-type: none"> • Which sex hormones influence the development and function of the reproductive organs and what is their role in this process? • Which sex hormones regulate the female ovarian and menstrual cycles and how does this occur? • How does the male reproductive make sperm and how is it delivered to the female reproductive tract? • How are eggs produced by the female reproductive system and how does this system create a hospitable environment for a zygote? • What are the differences between male and female gamete formation in meiosis? • What types of anatomical and physiological changes occur in the mother's body? • What are some of the reproductive system changes men and women experience as they age? 	<p>to produce eggs and provide a hospitable environment for a fertilized egg to develop.</p> <ul style="list-style-type: none"> • Both male and female gametes are created by a cell division called meiosis. • During pregnancy, there are anatomical as well as physiological changes to the mother's body. • Both men and women experience changes in their reproductive system functioning.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • The organs of the alimentary canal and the accessory digestive organs. • The overall function of the digestive system. • The general function of each digestive organ. 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Name the organs of the alimentary canal and the accessory digestive organs, and identify each on a diagram or model. • Identify the overall function of the digestive system and describe the general functions of each digestive organ. • Describe the gross and microscopic anatomy and

- The basic function of the mouth, pharynx and esophagus.
- The end products of protein, fat and carbohydrate digestion.
- The digestive function of bile.
- The definition of a kilocalorie and a nutrient.
- The six major nutrient categories.
- Why each type of nutrient is important for the cell.
- Some of the problems of the digestive system in the elderly, such as cancer and diverticulosis.
- Some of the disorders of the digestive system, such as Crohn's Disease.
- The regions of the kidney
- The structure of the kidney and how it is related to its function.
- The areas of the nephron that are responsible for filtrations, reabsorption and secretion.
- The composition of normal urine.
- The components of abnormal urine.
- The general structure of the ureters, urinary bladder and urethra.
- Some of the disorders of the urinary system, such as kidney stones.
- Some changes in the anatomy and physiology of the urinary system as one ages, including changes in

the basic functions of the mouth, pharynx and esophagus.

- Name the end products of protein, fat and carbohydrate digestion.
- State the digestive function of bile.
- Define nutrient and kilocalorie.
- List the six major nutrient categories.
- Identify dietary sources of each and why each is necessary for a cell.
- Explain the physiological effects of some of the disorders of the digestive system.
- Identify the regions of the kidney
- Identify the structural and functional unit of the kidney
- Describe the composition of normal urine • list abnormal urinary components
- Describe the general structure and function of the ureters, urinary bladder, and urethra.
- Explain the physiological effects of some of the disorders of the urinary system.
- Identify the reproductive organs of both the male and female.
- Discuss the composition of semen, and name the glands that produce it.
- Trace the pathway of sperm from the testes to the body exterior.
- Describe the structure of a sperm and relate its structure to its function.
- Describe the functions of the vesicular follicle and corpus luteum of the ovary.
- Compare and contrast spermatogenesis and oogenesis.
- Describe the influence of FSH and LH on both testes and ovarian function.
- Describe the phases and controls of the menstrual cycle.
- Describe implantation.
- Describe how labor is initiated and explain the three stages.
- Describe the importance of the presence or absence of testosterone during embryonic development of the reproductive organs.
- Identify common reproductive problems that occur

bladder capacity, urine concentration, and urinary tract infections.

- The reproductive system organs in both females and males.
- The composition of semen and the gland that produce it.
- The pathway that sperm travel from the testes to the exterior of the body.
- The structure of sperm and how it relates to its function.
- The function of the vesicular follicle and corpus luteum of the ovary.
- The similarities and differences between spermatogenesis and oogenesis.
- The influence FSH and LH has on testes and ovarian function.
- The phases and controls of the menstrual cycle.
- How implantation occurs.
- The major functions of the placenta.
- The three stages of labor.
- Why the presence or absence of testosterone is important during embryonic development of the reproductive organs.
- Some of the common reproductive problems that occur in adult and aging males and females.
- Some of the disorders and diseases of the male and female reproductive system

in adult and aging males and females. •

- Explain the physiological effects of some of the disorders of the male and female reproductive system.

such as pelvic inflammatory disease and prostate cancer.

OCEAN COUNTY SCIENCE CURRICULUM
Evidence of Learning

Formative Assessments

- Observations
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- Do-Now
- Laboratories/Lab Reports
- Notebooks
- Writing Assignments

Summative Assessments

- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Practical
- Mid-Term and Final Exams

Benchmark

- New Jersey Student Learning Assessment: Science (NJSLA)
- Quarterly Exams
- Unit Test
- Performance Assessment

Alternative

- Oral Presentation
- Video Recording
- Virtual Lab

Modifications (ELLs, Special Education, Gifted and Talented)

ELL:

- Audiobooks, Movies, and other digital media in lieu of print versions
- Native language tests and native language English Dictionary

Special Education/504:

- Response to Intervention (RTI)
- Follow all IEP modifications/504 plan
- Oral Instructions
- Record lessons instead of taking notes
- Outline of lessons
- Study guide with answers
- Word Processor to type notes
- Frequent breaks

Gifted and Talented:

- Peer Tutoring
- Cooperative learning groups
- Differentiated instruction

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Online Resources
- Laboratory manuals and equipment
- NJ DOE Model Curriculum Resources:

Teacher Notes: