

Secaucus
Board of
Education

Human Anatomy & Physiology

Course Code: 4311, 4315

Science Department



*Born on August 2016
Aligned to the NJSL – Science (2014), Technology (2014), 21st Century Life and Careers (2014), ELA
(2016) and Mathematics (2016)
Adopted by the Secaucus Board of Education on August 25, 2016*

District Equity Statement

The Board of Education directs that all students enrolled in the schools of this district shall be afforded equal educational opportunities in strict accordance with the law. No students shall be denied access to or benefit from any educational program or activity or from a co-curricular or athletic activity on the basis of the student's race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability. The Board directs the Superintendent to allocate faculty, administrators, support staff members, curriculum materials, and instructional equipment supplies among and between the schools and classes of this district in a manner that ensures equivalency of educational opportunity throughout this district. The school district's curricula in the following areas will eliminate discrimination, promote mutual acceptance and respect among students, and enable students to interact effectively with others, regardless of race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability:

1. School climate/learning environment
2. Courses of study, including Physical Education
3. Instructional materials and strategies
4. Library materials
5. Software and audio-visual materials
6. Guidance and counseling
7. Extra-curricular programs and activities
8. Testing and other assessments.

Excerpt from Secaucus Board of Education, Policy 5750, Edited September 2016

Course Description

Human Anatomy and Physiology is an honors course designed for students interested in a science and/or health related career. Class content will focus on the detailed studies of human body system structure and function, with a special emphasis on present day technological innovations and career opportunities in the health science field. Laboratory dissection activities and field trips will contextualize concepts learned throughout the semester. This life science course is an elective approved by the Secaucus Board of Education (SBOE). Students are encouraged to continue their study of Biology by taking this course offered to juniors and seniors in high school. The goal of this course is to help students build a deeper understanding of the human body on the foundation of their prior learning in PSI Physics, Chemistry, and Biology courses.

Course Outline

Chapter 1: The Human Body: An Orientation

- An Overview of Anatomy and Physiology
- Levels of Structural Organization
- Maintaining Life
- Homeostasis
- The Language of Anatomy

Chapter 2: Basic Chemistry

- Concepts of Matter and Energy
- Composition of Matter

- Molecules and Compounds
- Chemical Bonds and Chemical Reactions
- Biochemistry: The Chemical Composition of Living Matter

Chapter 3: Cells and Tissues

- Cells
- Body Tissues
- Developmental Aspects of Cells and Tissues

Chapter 4: Cells: Skin and Body Membranes

- Classification of Body Membranes.
- Integumentary System (Skin).
- Developmental Aspects of Skin and Body Membranes

Chapter 5: The Skeletal System

- Bones: An Overview
- Axial Skeleton
- Appendicular Skeleton
- Joints
- Developmental Aspects of the Skeleton

Chapter 6: The Muscular System

- Overview of Muscle Tissues
- Microscopic Anatomy of Skeletal Muscle
- Skeletal Muscle Activity
- Muscle Movements, Types, and Names

Chapter 7: The Nervous System

- Organization of the Nervous System
- Nervous tissue: Structure and Function
- Central Nervous System
- Peripheral Nervous System
- Developmental Aspects of the Nervous System

Chapter 8: Special Senses

- The Eye and Vision
- The Ear: Hearing and Balance
- Chemical Senses: Taste and Smell
- Developmental Aspects of the Special Senses

Chapter 9: The Endocrine System

- The Endocrine System and Hormone Function – An Overview

- The Major Endocrine Organs
- Other Hormone-Producing Tissues and Organs
- Developing Aspects of the Endocrine System

Chapter 10 – Blood

- Composition and Functions of Blood
- Hemostasis
- Blood Groups and Transfusions
- Developmental Aspects of Blood

Chapter 11 – The Cardiovascular System

- Cardiovascular System: The Heart
- Cardiovascular System: Blood Vessels
- Developmental Aspects of the Cardiovascular System

Chapter 12 – The Lymphatic System and Body Defenses

- Lymphatic System
- Body Defenses
- Developmental Aspects of the Lymphatic System and Body Defenses

Chapter 13 – The Respiratory System

- Functional Anatomy of the Respiratory System
- Respiratory Physiology
- Respiratory Disorders
- Developmental Aspects of the Respiratory System

Chapter 14 – The Digestive System and Body Metabolism

- Anatomy of the Digestive System
- Functions of the Digestive System
- Nutrition
- Metabolism
- Developmental Aspects of the Digestive System and Metabolism

Chapter 15 – The Urinary System

- Kidneys
- Ureters, Urinary Bladder, and Urethra
- Fluid, Electrolyte, and Acid-Base Balance.
- Developmental Aspects of the Urinary System

Chapter 16 – The Reproductive System

- Anatomy of the Male Reproductive System

- Male Reproductive Functions
- Anatomy of the Female Reproductive System
- Female Reproductive Functions and Cycles
- Mammary Glands
- Survey of Pregnancy and Embryonic Development.
- Developmental Aspects of the Reproductive System.

Requirements and Expectations

Students are expected to arrive in class promptly with their class materials (binder, pencils, etc). During class students are expected to positively participate in class, respecting their teacher and their peers. Students are also expected to follow any and all Secaucus High School rules of behavior found on the school's website.

Students are able to determine how they want to take notes and store class documents. A designated three ring binder will be suggested but students can make use of individual folders or any system they have found to work for them and keep them organized. The class's documents will be numerous. They may include notes, handouts, lab procedures, lab reports, homework assignments, and vocabulary. An organized system will help prepare the students for both the midterm exam, final exam, and college as some students who take the course are college bound.

The pacing, topics, and teaching methodology presented in this curriculum may be modified at the teacher's discretion on the basis of, but not limited to, academic level of the course, student performance, student needs, and school schedule.

Coursework and Assessment

Each Human Anatomy and Physiology teacher will determine how their classroom will be assessed. Teachers will use a mix of test, quiz, homework, laboratory, and participation grades to calculate the student's final grade. Teachers can either use a point or percentage calculation for the grade.

Midterms and Finals

In addition to four quarterly grades, students will also earn a separate grade on their transcript for their midterm and final exams. Each quarterly grade carries a weight of 20% of the full year grade while these two exams each have a weight of 10%, giving them the same weight as a single quarter's result.

The midterm exam will be on the work covered through the first two quarters (September through January). The final exam will be on the work through the second two quarters (February through June). The final is not cumulative.

Teacher Availability

Human Anatomy & Physiology teachers will have a scheduled tutoring time as agreed to in their contract with SBOE. They can also be available by appointment should a student request a different time. The concepts covered in Human Anatomy & Physiology are life science concepts. With that in mind, students can get assistance from any Biology teacher if the Human Anatomy & Physiology teacher is not available. Students are encouraged to work together to build better understanding while at the same time understanding that plagiarism and cheating are unacceptable.

Human Anatomy & Physiology teachers are also available to both students and parents via school email address, which are located on the SBOE website.

Course Modifications (ELLs, Special Education, Gifted and Talented)

The course instructor will determine, with the assistance of guidance counselors, teacher assistant/aides, and/or special education teachers, what modifications will be made for his/her students. Such examples of modifications can include, but not be limited to:

- Extended time as needed
- Modification of tests and quizzes
- Preferential seating
- Alternative/Formative assessment (projects)
- Effective teacher questioning (ranging from simple recall to higher order critical thinking questions)
- Supplemental materials
- Cooperative learning
- Teacher tutoring
- Peer tutoring
- Differentiated Instruction

Interdisciplinary Connections

The following NJSLS for ELA, Mathematics, College and Career Readiness and Technology depict what standards align to the science standards taught in this Anatomy & Physiology Course.

NJSLS - 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. (HS-LS1-1),(HS-LS1-6)
- ❖ WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1- 1),(HS-LS1-6)
- ❖ WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS1-6)
- ❖ 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)
- ❖ WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)

- ❖ SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
(HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

NJSLS - Mathematics:

- ❖ 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)

NJSLS – Technology:

- ❖ 8.1.12.A.1 Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
- ❖ 8.1.12.A.2 Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
- ❖ 8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
- ❖ 8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
- ❖ 8.1.12.A.5 Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

NJSLS – 21st Century Life and Careers:

- ❖ CRP1. Act as a responsible and contributing citizen and employee.
- ❖ CRP2. Apply appropriate academic and technical skills.
- ❖ CRP4. Communicate clearly and effectively and with reason.
- ❖ CRP5. Consider the environmental, social and economic impacts of decisions.
- ❖ CRP6. Demonstrate creativity and innovation.
- ❖ CRP7. Employ valid and reliable research strategies.
- ❖ CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- ❖ CRP11. Use technology to enhance productivity.
- ❖ CRP12. Work productively in teams while using cultural global competence.

Curriculum Plan

Chapter 1 Lesson Plan – The Human Body: An Orientation			
Teacher:	SBOE Faculty	Time Frame:	6 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI			
HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
<ol style="list-style-type: none"> 1. Why would you have a hard time learning and understanding physiology if you did not also understand anatomy? 2. Kidney function, bone growth, and beating of the heart are all topics of anatomy. True or false? 3. At which level of structural organization is the stomach? At which level is a glucose molecule? 4. Which organ system includes the trachea, lungs, nasal cavity, and bronchi? 5. What functions must an organism perform if it is to survive? 6. Oxygen is a survival need. Why is it so important? 7. When we say that the body demonstrates homeostasis, do we mean that conditions in the body are unchanging? 8. Is the thirst sensation part of a negative or a positive feedback control system? Defend your choice. 9. What is the anatomical position and why is understanding this position important to an anatomy student? 10. To separate the thoracic cavity from the abdominal cavity of a cadaver, which type of section would you make? 11. Of the spinal cord, small intestine, uterus, and heart, which are in the dorsal body cavity? 			
Knowledge & Skills			
<p>By the end of this unit, students will know:</p> <ul style="list-style-type: none"> o The difference and interrelationship between anatomy and physiology o The levels of structural organization in the human body o What homeostasis is and how it is important for life o Terminology necessary to describe the human body surfaces, directions, and body planes o The body’s major body cavities and main organs in each body system 		<p>By the end of this unit, students will be able to:</p> <ul style="list-style-type: none"> o Define anatomy and physiology. o Explain how anatomy and physiology are related. o Name the six levels of structural organization that make up the human body, and explain how they are related. o Name the organ systems of the body, and briefly state the major functions of each system. o Identify and/ classify by organ system all organs discussed. o Define homeostasis, and explain its importance. o Define negative feedback, and describe its role in maintaining homeostasis and normal body function. o Verbally describe or demonstrate the anatomical position. o Use proper anatomical terminology to describe body directions, surfaces, and body planes. 	

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| | o Locate the major body cavities, and list the chief organs in each cavity. |
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Assessment	
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During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.	
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Chapter 2 Lesson Plan – Basic Chemistry

Teacher:	SBOE Faculty	Time Frame:	9 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (HS-LS1-6)		
Essential Questions			
<ol style="list-style-type: none"> 1. Matter and energy – how are they interrelated? 2. What form of energy is used to transmit messages from one part of the body to another? 3. What type of energy is available when we are still? When we are exercising? 4. What does it mean when we say that some energy is “lost” every time energy changes from one form to another? 5. Which four elements make up the bulk of living matter? 6. How is an atom related to an element? 7. What is an atom’s atomic number? What is its atomic mass number? 8. What name is given to an unstable atom that has either more or fewer neutrons than its typical number? 9. How do ionic bonds differ from covalent bonds? 10. What kind of bond forms between water molecules? 11. Which of the reaction types depicted in Figure 2.10 occurs when fats are digested in your small intestine? 12. How can you indicate that a chemical reaction is reversible? 13. What property of water prevents rapid changes in body temperature? 14. Which is a proton donor – an acid or a base? 15. Is a pH of 11 acidic or basic? 16. Biochemistry is “wet” chemistry. What does this statement mean? 17. Salts are electrolytes. What does that mean? 18. What are the structural units, or building blocks, of carbohydrates? Of lipids? 19. Which type of lipid is abundant in cellular membranes? 20. Is the formation of glycogen from glucose an example of hydrolysis or dehydration synthesis? 21. What is the primary structure of proteins? 22. Of the fibrous and globular proteins, which is more important for building body structures? 23. How does an enzyme recognize its substrate(s)? 24. How do DNA and RNA differ from each other in the kinds of bases and sugars they contain? 25. What is the vital importance of ATP to body cells? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	

<ul style="list-style-type: none"> ○ The difference between matter and energy ○ The forms energy can be found as ○ How atoms and elements are related ○ What isotopes are ○ What molecules are ○ The kinds of chemical reactions ○ What acids and bases are ○ What pH is ○ What ATP is and how it is an important energy transferring molecule 	<ul style="list-style-type: none"> ○ Differentiate matter from energy. ○ List four major energy forms and provide one example of how each energy form is used in the body. ○ Define chemical element, and list the four elements that form the bulk of body matter. ○ Explain how elements and atoms are related. ○ Define radioisotope, and describe briefly how radioisotopes are used in the diagnosis and treatment of disease. ○ Define molecule, and explain two molecules are related to compounds. ○ Recognize that chemical reactions involve the interaction of electrons to make and break chemical bonds. ○ Differentiate ionic, polar covalent, and nonpolar covalent bonds, and describe the importance of hydrogen bonds. ○ Contrast synthesis, decomposition, and exchange reactions. ○ Explain the importance of water to body homeostasis, and provide several examples of the roles of water. ○ List several salts/their ions) important to body functioning. ○ Differentiate a salt, an acid, and a base. ○ Explain the concept of pH, and state the pH of blood. ○ Explain the role of dehydration synthesis and hydrolysis in formation and breakdown of organic molecules. ○ Compare and contrast carbohydrates and lipids in terms of their building blocks, structures, and functions in the body. ○ Differentiate fibrous proteins from globular proteins. ○ Define enzyme, and explain the role of enzymes. ○ Compare and contrast the structure and functions of DNA and RNA. ○ Explain the importance of ATP in the body.
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 3 Lesson Plan – Cells and Tissues

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes		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)	
Essential Questions			
<ol style="list-style-type: none"> 1. How do Hooke’s “cells” differ from the current meaning of cell? 2. Name the three basic parts of a cell and give the location of each. 3. How would you explain the meaning of a “generalized cell” to a classmate? 4. What is the general function of nucleoli? 5. Why do phospholipids organize into a bilayer, tail to tail, in a watery environment? 6. What are three roles these sugar-coated proteins play in the life of a cell? 7. What is the special function of gap junctions? Of tight junctions? 8. How do the cytosol and the cytoplasm differ? 9. Which two organelles are sacs of enzymes and what is the function of each of these organelles? 10. Which organelle is the major site of ATP synthesis? Which packages proteins? 11. Which two types of cytoskeletal elements are involved in cell mobility? 12. Which of the cytoskeletal elements is the basis of centrioles? Of microvilli? 13. What is the major function of microvilli? 14. Name the two cell types involved in connecting body parts or regions. 15. What is the main function of a neuron? 16. What is the energy source for all types of diffusion? 17. What determines the direction of any diffusion process? 18. What are the two types of facilitated diffusion and how do they differ 19. What happens when the Na⁺-K⁺ pump is phosphorylated? When K⁺ binds to the pump protein? 20. Which vesicular transport process moves large particles into the cell? 21. Which process is more selective – pinocytosis or receptor-mediated endocytosis? 22. How do the terms template strand and complimentary relate to DNA synthesis? 23. What are the two stages of protein synthesis, and in which stage are proteins actually synthesized? 24. What two criteria are used to classify epithelial tissues? 25. How do endocrine and exocrine glands differ in structure and function? 26. Which of the following properties apply to epithelial tissues? Has blood vessels, can repair itself, cells have specialized cell junctions. 27. How do connective tissues differ from other tissues? 			

28. Which muscle type(s) is injured when you pull a muscle while exercising?
29. How does the extended length of a neuron's processes aid its function in the body?
30. Which of the four types of tissue is most likely to remain mitotic throughout life?
31. What is a neoplasm? How does the activity of endocrine glands change as the body ages?

Knowledge & Skills

By the end of this unit, students will know:

- o The four elements that make up living matter
- o The difference between cells and organelles
- o How to construct an animal and plant cell diagram
- o The defining structures of a cell nucleus
- o The specific function of cell organelles, DNA, and RNA.
- o How to differentiate among types of body tissue

By the end of this unit, students will be able to:

- o Name the four elements that make up the bulk of living matter and list several trace elements.
- o Define cell, organelle, and inclusion.
- o Identify on a cell model or diagram the three major cell regions (nucleus, cytoplasm, and plasma membrane).
- o List the structures of the nucleus and explain the function of the chromatin and nucleoli.
- o Identify the organelles on a cell model or describe them, and discuss the major function of each.
- o Define selective permeability, diffusion (including simple and facilitated diffusion and osmosis), active transport, passive transport, solute pumping, exocytosis, endocytosis, phagocytosis, bulk-phase endocytosis, hypertonic, hypotonic, and isotonic.
- o Describe the structure of the plasma membrane. Explain how the various transport processes account for the directional movements of specific substances across it.
- o Describe briefly the process of DNA replication and of mitosis. Explain the importance of mitotic cell division.
- o In relation to protein synthesis, describe the roles of DNA and of the three varieties of RNA.
- o Name some cell types and relate their overall shape and internal structure to their special functions.
- o Name the four major tissue types and explain their chief subcategories. Explain how the four major tissue types differ structurally and functionally.
- o Give the main locations of various tissue types in the body
- o Describe the process of tissue repair (wound healing).
- o Define neoplasm, and distinguish between benign and malignant neoplasms.
- o Explain the significance of the fact that some tissue types (muscle and nerve) are largely abiotic after the growth stages are over.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 4 Lesson Plan – Skin and Body Membranes

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes		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)	
Essential Questions			
<ol style="list-style-type: none"> 1. How do the body locations of serous and mucous membranes differ? 2. Name the six serous membrane layers from the body surface into the heart. 3. Where would you find a synovial membrane? 4. Explain the relationships between the words skin, cutaneous membrane, integument, and integumentary system. 5. What are three important functions of the integumentary system? 6. What cell type is most abundant in the epidermis? 7. Which layer of the epidermis produces new epidermal cells? 8. What is the name of that skin layer that is seen as dandruff? 9. What pigments determine skin color? 10. What are the three concentric regions of a hair shaft, from the outside in? 11. What is sebum? 12. How do secretions of apocrine glands differ from those of the eccrine sweat glands? 13. When a factory worker caught his finger in a machine, the entire nail, plus the nail matrix and bed, was torn off. Will his nail grow back? Why or why not? 14. What are the two life-threatening consequences of a severe burn? 15. What are the criteria for classifying burns as first-, second-, or third-degree? 16. What name is given to the rule for recognizing the signs of melanoma? 17. What is the single most common risk factor for skin cancer? 18. Why do no skin cancers develop from the stratum corneum cells? 19. What change in aging skin accounts for wrinkles and cold intolerance in older adults? 20. What is the source of vernix caseosa that covers the skin of the newborn baby? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	
<ul style="list-style-type: none"> ○ The general structures and functions of each membrane type ○ How to construct a model of human skin ○ The underlying process of skin pigmentation 		<ul style="list-style-type: none"> ○ List the general functions of each membrane type – cutaneous, mucous, serous, and synovial – and give its location in the body. ○ Compare the structure (tissue makeup) of the major membrane types. 	

<ul style="list-style-type: none"> ○ The intricacies of skin function 	<ul style="list-style-type: none"> ○ List several importance functions of the integumentary system and explain how these functions are accomplished. ○ When provided with a model or diagram of the skin, recognize and name the following skin structures: epidermis, dermis (papillary and reticular layers), hair and hair follicle, sebaceous gland, and sweat gland. ○ Name the layers of the epidermis and describe the characteristics of each. ○ Describe the distribution and function of the epidermal derivatives – sebaceous glands, sweat glands, and hair. ○ Name the factors that determine skin color and describe the function of melanin. ○ Differentiate between first-, second-, and third-degree burns. ○ Explain the importance of the “rule of nines.” ○ Summarize the characteristics of basal cell carcinoma, squamous cell carcinoma, and malignant melanoma. ○ List several examples of integumentary system aging.
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 5 Lesson Plan – The Skeletal System

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes		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)	
Essential Questions			
<ol style="list-style-type: none"> 1. What is the relationship between muscle function and bones? 2. What are the two functions of a bone’s marrow cavities? 3. Where are the most long bones found in the body? 4. What is the anatomical name for the shaft of a long bone? For its ends? 5. How does the structure of compact bone differ from spongy bone when viewed with the naked eye? 6. What is the importance of canaliculi? 7. Bones don’t begin as bones. What do they begin as? 8. Which stimulus – PTH (a hormone) or mechanical forces acting on the skeleton – is more important in maintaining blood calcium levels than in maintaining bone strength? 9. If osteoclasts in a long bone are more active than osteoblasts, what change in bone mass is likely to occur? 10. What is a fracture? What two fracture types are particularly common in older people? 11. What are the three main parts of the axial skeleton? 12. Which skull bone(s) form the “keystone of the face”? 13. Which bone has the cribriform plate and crista galli? 14. Which bones are connected by the coronal suture? 15. By the sagittal suture? 16. What are the five major regions of the vertebral column? 17. How can you distinguish a lumbar vertebra from a cervical vertebra? 18. What is a true rib? A false rib? 19. Besides the ribs & sternum, there is a third group of bones forming the thoracic cage. What is it? 20. What bone class do the ribs and skull bones fall into? 21. Contrast the general function of the axial skeleton to that of the appendicular skeleton? 22. What is the single point of attachment of the shoulder girdle to the axial skeleton? 23. What bone forms the skeleton of the arm? 24. Where are the carpals found, and what type (long, short, irregular, or flat) of bone are they? 25. Which bones of the upper limb have a styloid process? 26. What three bones form the hip bone? What tow bones from each pectoral girdle? 			

27. In what three ways does the bony pelvis of a woman differ from that of a man?
28. What two bones form the skeleton of the leg?
29. Which lower limb bone has an intertrochanteric line and crest and an intercondylar fossa?
30. What are the functions of joints?
31. What is the major difference between a fibrous joint and a cartilaginous joint?
32. Where is the synovial membrane found, and what is its role?
33. What 2 joints of the body are ball-and-socket joints? What is the best example of a saddle joint?
34. Which spinal curvatures are present at birth?
35. How does the shape of a newborn baby's spine differ from that of an adult?
36. Which two regions of the skeleton grow most rapidly during childhood?

Knowledge & Skills

By the end of this unit, students will know:

- The various parts and functions of a vertebrate skeleton
- How to distinguish among the different types of bones
- The difference among different types of fractures
- Diseases associated with bone problems

By the end of this unit, students will be able to:

- Identify the subdivisions of the skeleton as axial or appendicular.
- List at least three functions of the skeletal system.
- Name the four main kinds of bones.
- Identify the major anatomical areas of long bone.
- Explain the role of bone salts and the organic matrix in making bone both hard and flexible.
- Describe briefly the process of bone formation in the fetus and summarize the events of bone remodeling throughout life.
- Name and describe the various types of fractures.
- On a skull or diagram, identify and name the bones of the skull.
- Describe how the skull of a newborn infant (or fetus) differs from that of an adult, and explain the function of fontanelles.
- Name the parts of a typical vertebra and explain in general how the cervical, thoracic, and lumbar vertebrae differ from one another.
- Discuss the importance of the intervertebral discs and spinal curvatures.
- Explain how the abnormal spinal curvatures (scoliosis, lordosis, and kyphosis) differ from one another.
- Identify on a skeleton or diagram the bones of the shoulder and pelvic girdles and their attached limbs.
- Describe the important differences between a male and female pelvis.
- Name the three major categories of joints and compare the amount of movement allowed by each.
- Identify some of the causes of bone and joint problems throughout life.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 6 Lesson Plan – The Muscular System

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			
<ol style="list-style-type: none"> 1. How do cells of the three types of muscle tissues differ from one another anatomically? 2. Which muscle type has the most elaborate connective tissue wrappings? 3. What does striated mean relative to muscle cells? 4. How do the movements promoted by skeletal muscle differ from those promoted by smooth muscle? 5. Specifically, what is responsible for the banding pattern in muscle cells? 6. What two structures are closely associated at a neuromuscular junction? 7. What ions enter the muscle cell during action potential generation? 8. What chemical – ATP or Ca²⁺ - triggers sliding of the muscle filaments? 9. What are the three energy sources for skeletal muscle contraction? 10. What is the immediate source of energy for muscle contraction? 11. What is meant by the term oxygen deficient? 12. To develop big, beautiful skeletal muscles, should you exercise focus be aerobic or resistance type exercise? 13. What action is being performed by a person who sticks out his thumb to hitch a ride? 14. What actions take place at the neck when you nod your head up and down as if saying “yes”? 15. In what way are fixators and synergist muscles important? 16. What muscle raises your eyebrow? 17. Which two muscles are synergists in jaw closure? 18. Which muscle group is the prime mover of back extension? 19. What structural feature makes the abdominal musculature especially strong for its thickness? 20. Which muscle of the posterior trunk is the synergist of the pectoralis major muscle in arm adduction? 21. Which muscle is the antagonist of the biceps brachii when the biceps flexes the elbow? 22. Which muscle group is the antagonist of the hamstring muscles? 23. What are two good sites for intramuscular injections in adults? 24. Which two muscles insert into the calcaneal tendon? Which movement do they effect? 25. What must happen before babies can control their muscles? 26. How does lifelong exercise affect our skeletal muscles and muscle mass in old age? 			

Knowledge & Skills

By the end of this unit, students will know:

- The differences among body muscle types
- The intricacies of a muscle contraction
- The names and functions of all the body's muscles
- How energy contributes to normal muscle function

By the end of this unit, students will be able to:

- Identify the subdivisions of the skeleton as axial or appendicular.
- Describe similarities and differences in the structure and function of the three types of muscle tissue and indicate where they are found in the body.
- Define muscular system.
- Define and explain the role of the following: endomysium, perimysium, epimysium, tendon, and aponeurosis.
- Describe the microscopic structure of the skeletal muscle and explain the role of actin- and myosin-containing myofilaments.
- Describe how an action potential is initiated in a muscle cell.
- Describe the events of muscle contraction.
- Define graded response, tetanus, isotonic, and isometric contractions, and muscle tone as these terms apply to a skeletal muscle.
- Describe three ways in which ATP is regenerated during muscle activity.
- Define oxygen debt and muscle fatigue and list possible causes of muscle fatigue.
- Describe the effects of aerobic and resistance exercise on skeletal muscles and other body organs.
- Define origin, insertion, prime mover, antagonist, synergist, and fixator as they relate to muscles.
- Demonstrate or identify the different types of body movements.
- List some criteria used in naming muscles.
- Name and locate the major muscles of the human body (on a torso model, muscle chart, or diagram) and state the action of each.
- Explain the importance of a nerve supply and exercise in keeping muscles healthy.
- Describe the changes that occur in aging muscles.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 7 Lesson Plan – The Nervous System

Teacher:	SBOE Faculty	Time Frame:	13 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		

Essential Questions

1. Name the structures that make up the CNS and those that make up the PNS.
2. Which glial cells are most abundant in the body? Which produce the insulating material called myelin?
3. Why is a brain tumor more likely to be formed from glial cells than from neurons?
4. How does a tract differ from a nerve?
5. How does a ganglion differ from a nucleus?
6. Which part of a neuron conducts impulses toward the cell body? Which part releases neurotransmitters?
7. What is the difference between a graded potential and an action potential?
8. How is stimulus transmitted across a synapse?
9. Which portion(s) of a neuron is (are) likely to be associated with a sensory receptor or a sensory organ?
10. What is a reflex?
11. What are the three major regions of the cerebrum?
12. What is the composition of white matter of the brain?
13. Which brain region controls such vital activities as breathing and blood pressure – cerebrum, brain stem, or cerebellum?
14. What is the function of the cerebellum?
15. In what major brain region are the thalamus, hypothalamus, and pineal gland found?
16. What name is given to the cerebrospinal fluid-filled cavities within the brain?
17. What name is given to the barrier that protects the brain from toxic chemicals?
18. Which meningeal layer provides the means for draining cerebrospinal fluid back into the blood – dura matter, arachnoid matter, or pia mater?
19. What is found in the gray matter of the spinal cord?
20. Which spinal cord pathways are sensory pathways – ascending or descending?
21. Why is the leash of nerve fibers at the end of the spinal cord called the cauda equina?
22. Where is the epineurium located?
23. Which cranial nerve pair is the only one to serve structures outside of the head and neck?
24. What is the nerve plexus?
25. Ron has a horrible pain in his right buttock, thigh, and leg.
26. He is told he has sciatica. Which spinal nerve is involved, and what plexus does it belong to?
27. Which regions or organs of the body are served by the autonomic nervous system? Which are served by the somatic nervous system?

28. How does the motor pathway of the autonomic nervous system differ from that of the somatic nervous system?
29. Which division of the autonomic nervous system is the “fight-or-flight” system?
30. Why must premature babies be placed in incubators until their hypothalamus matures?
31. What is orthostatic hypotension? Why do many older people suffer from this condition?

Knowledge & Skills

By the end of this unit, students will know:

- o The intricacies of the nervous system
- o The parts of a neuron
- o The differences between the central and peripheral nervous system
- o The various functions of the different types of nerves
- o The structures and functions of the nervous systems divisions.
- o The workings of the human brain

By the end of this unit, students will be able to:

- o List the general functions of the nervous system.
- o Explain the structural and functional classifications of the nervous system.
- o Define central nervous system and peripheral nervous system and list the major parts of each.
- o State the function of neurons and neuroglia.
- o Describe the general structure of a neuron and name its important anatomical regions.
- o Describe the composition of gray matter and white matter.
- o List the two major functional properties of neurons.
- o Classify neurons according to structure and function.
- o List the types of general sensory receptors and describe their functions.
- o List the types of general sensory receptors and describe their functions.
- o Describe the events that lead to the generation of a nerve impulse and its conduction from one neuron to another.
- o Define reflex arch and list its elements.
- o Identify and indicate the functions of the major regions of the cerebral hemispheres, diencephalon, brain stem, and cerebellum on a human brain model or diagram.
- o Name the three meningeal layers and state their functions.
- o Discuss the formation and function of cerebrospinal fluid and the blood-brain barrier.
- o Compare the signs of a CVA with those of Alzheimer’s disease; of a contusion with those of a concussion.
- o Define EEG and explain how it evaluates neural functioning.
- o List two important functions of the spinal cord.
- o Describe spinal cord structure.
- o Describe the general structure of a nerve.
- o Identify the cranial nerves by number and by name, and list the major functions of each.
- o Describe the origin and fiber composition of (a) ventral and dorsal roots, (b) the spinal nerve proper, and (c) ventral and dorsal rami.
- o Discuss the distribution of the dorsal and ventral rami of spinal nerves.
- o Name the four major nerve plexuses, give the major nerves of each, and describe their distribution.
- o Identify the site of origin and explain the function of the sympathetic and parasympathetic divisions of the autonomic nervous system.

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| | <ul style="list-style-type: none">○ Contrast the effect of the parasympathetic and sympathetic divisions on the following organs: heart, lungs, digestive system, blood vessels.○ List several factors that may have harmful effects on brain development.○ Briefly describe the cause, signs, and consequences of the following congenital disorders: spina bifida, anencephaly, cerebral palsy.○ Explain the decline in brain size and weight that occurs with age.○ Define senility and list some possible causes. |
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 8 Lesson Plan – Special Senses

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
<ol style="list-style-type: none"> 1. What is the role of the eyelids? 2. Which structure of the eye forms tears? 3. What are tears? 4. What is the visual role of the external eye muscles? 5. What is the meaning of the term blind spot in relation to the eye? 6. What function does the choroid of the vascular layer have in common with the pigmented layer of the retina? 7. How do the rods and cones differ from each other? 8. What are the refractory media of the eye? 9. What name is given to the ability of the eye to focus or close objects? 10. What is the difference between the optic tract and the optic nerve? 11. In what way does the photopupillary reflex protect the eyes? 12. Which region(s) of the ear (external, middle, or internal) serve hearing only? 13. Which structures of the ear transmit sound vibrations from the eardrum to the oval window? 14. What sense to the vestibule and semicircular canals serve? 15. Benji is enjoying a boat ride until a storm suddenly descends on the bay. Soon he is nauseated and can barely stand up. Which equilibrium receptors – static or dynamic – are operating furiously during such a rough voyage? 16. What are otoliths, and what is their role in equilibrium? 17. From the air outside the body, through what substances do sound waves travel to excite receptor cells of the cochlea? 18. Which nerve transmits impulses from the spiral organ of Corti to the brain? 19. Do high-pitched sounds peak close to or far from the oval window? 20. How do sensorineural and conductive deafness differ from each other? 21. What name is used to describe both taste and smell receptors? Why? 22. Where, relative to specific structures, are most taste buds located? 23. Why does it help to sniff substances you are smelling? 24. Fifty-year-old Mrs. Bates is complaining that she can't read without holding the newspaper out arm's length. What name is given to her problem? 25. Which of the special senses is least mature at birth? 26. What is presbycusis? 			

Knowledge & Skills

By the end of this unit, students will know:

- The details associated with the major sense organs of the body

By the end of this unit, students will be able to:

- When provided with a model or diagram, identify the accessory eye structures and list the functions of each.
- Name the eye tunics and indicate the major function of each.
- Explain how rod and cone cells differ.
- Describe image formation and on the retina.
- Trace the pathway of light through the eye to the retina.
- Discuss the importance of an ophthalmoscopic examination.
- Define the following terms: accommodation, astigmatism, blind spot, cataract, emmetropia, glaucoma, hyperopia, myopia, and refraction.
- Trace the visual pathway to the optic cortex.
- Discuss the importance of the papillary and convergence reflexes.
- Identify the structures of the external, middle, and internal ear, and list the functions of each.
- Explain the function of the organ of Corti in hearing.
- Define sensorineural and conductive deafness and list possible causes of each.
- Explain how one is able to localize the source of a sound.
- Describe how equilibrium in organs help maintain balance.
- Describe the location, structure, and function of the olfactory and taste receptors.
- Name the four basic taste sensations and list factors that modify the sense of taste.
- Describe changes that occur with age in the special sense organs.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 9 Lesson Plan – The Endocrine System

Teacher:	SBOE Faculty	Time Frame:	7 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	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)		
Essential Questions			
<ol style="list-style-type: none"> 1. Walking barefoot, you step on a piece of broken glass and immediately pull your foot back. Why is it important that the signaling triggering this motion come from the nervous system and not from the endocrine system? 2. What is a hormone? What does target organ mean? 3. Why is cAMP called a second messenger? 4. What are two important differences between endocrine and exocrine glands? 5. What are trophic hormones? 6. Both the anterior pituitary and the posterior pituitary release hormones, but the posterior pituitary is not an endocrine gland. What is it? 7. Barry is excreting huge amounts of urine. He has an endocrine system problem, but it is not diabetes mellitus, which has a similar sign. What is his possible problem? 8. Why is iodine important for proper thyroid gland function? 9. How are the thyroid and parathyroid glands linked automatically? 10. What hormone increases blood calcium levels, and which endocrine gland produces this hormone? 11. What hormone reduces blood calcium levels, and which endocrine gland produces this hormone? 12. What hormone stimulates the kidneys to reabsorb more sodium? 13. Which group of hormones produced by the adrenal cortex has some of the same effects as the hormones of the ovaries and the testes? 14. Mrs. Bellamy’s husband has suffered a heart attack and is hospitalized. Would you expect her blood glucose levels to be elevated, normal, or lower than normal? Why? 15. Insulin and glucagon are both pancreatic hormones. Which stimulates cellular uptake of glucose? 16. What hormone is called the sleep hormone, and which endocrine organ produces it? 17. How do thymosin and other thymus hormones help to protect the body? 18. Which gonadal hormone causes a young girl’s reproductive organs to mature at puberty – estrogen or progesterone? 19. Which two digestive system organs are important sources of hormones associated with digestion? 20. What temporary organ produces the same hormones as the ovaries? 21. Failure of which endocrine organ(s) leads to menopause in women? 22. In the elderly, the decline in levels of which hormone is associated with muscle atrophy? With osteoporosis in women? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	

<ul style="list-style-type: none"> ○ What glands/organs are associated with the endocrine system ○ How the endocrine system functions ○ How positive and negative feedback loops function ○ Abnormalities associated with the endocrine system 	<ul style="list-style-type: none"> ○ Define hormone and target organ. ○ Describe how hormones bring about their effects in the body. ○ Explain how various endocrine glands are stimulated to release their hormonal products. ○ Define negative feedback and describe its role in regulating blood levels of the various hormones. ○ Describe the difference between endocrine and exocrine glands. ○ On an appropriate diagram, identify the major endocrine glands and tissues. ○ List the hormones produced by the endocrine glands and discuss their general functions. ○ Discuss ways in which hormones promote body homeostasis by giving examples of hormonal actions. ○ Describe the functional relationship between the hypothalamus and the pituitary gland. ○ Describe major pathological consequences of hypersecretion and hyposecretion of the hormones considered in their chapter. ○ Indicate the endocrine role of the kidneys, the stomach and intestine, the heart, and the placenta. ○ Describe the effect of aging on the endocrine system and body homeostasis.
Assessment	
Acceptable evidence to show desired results	
<p>During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.</p>	

Chapter 10 Lesson Plan – Blood

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
<ol style="list-style-type: none"> 1. Which body organ plays the main role in producing plasma proteins? 2. What are the three major categories of formed elements? 3. What determines whether blood is bright red (scarlet) or dull red? 4. What is the role of hemoglobin in the red blood cell? 5. Which white blood cells are most important in body immunity? 6. If you had a severe infection, would you expect your WBC count to be closest to 5,000, 10,000, or 15,000/mm³? 7. Little Lisa is pale and listless. What disorder of erythrocytes might she be suffering from? 8. What is the name of the stem cell that gives rise to all formed elements? 9. What property of RBCs dooms them to a limited life span of about 120 days? 10. How is the production of platelets different from that of all other formed elements? 11. What factors enhance the risk of thrombus formation in intact blood vessels? 12. What are the classes of human blood groups based on? 13. What is the probable result of infusing mismatched blood? 14. Cary is bleeding profusely after being hit by a truck as he was pedaling his bike home. At the hospital, the nurse asked him whether he knew his blood type. He told her that he “had the same blood as most other people.” What is his ABO blood type? 15. What is the difference between an antigen and an antibody? 16. How does fetal hemoglobin differ from that of the adult? 17. What blood-related disorders are particularly common in the elderly? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	
<ul style="list-style-type: none"> ○ . 		<ul style="list-style-type: none"> ○ Indicate the composition and volume of whole blood. ○ Describe the composition of plasma and discuss its importance in the body. ○ List the cell types making up the formed elements and describe the major functions of each type. ○ Define anemia, polycythemia, leucopenia, and leukocytosis, and list possible causes for each condition. 	

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| | <ul style="list-style-type: none">○ Explain the role of the hemocytoblast.○ Describe the blood-clotting process.○ Name some factors that may inhibit or enhance the blood-clotting process.○ Describe the ABO and Rh blood groups.○ Explain the basis for a transfusion reaction.○ Explain the basis of physiologic jaundice seen in some newborn babies.○ Indicate blood disorders that increase in frequency in the aged. |
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 11 Lesson Plan – The Cardiovascular System

Teacher:	SBOE Faculty	Time Frame:	16 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
<ol style="list-style-type: none"> 1. What is the location of the heart in the thorax? 2. Which heart chamber has the thickest walls? What is the functional significance of this structural difference? 3. How does the function of the systemic circulation differ from that of the pulmonary circulation? 4. Why are the heart valves important? 5. Why might a thrombus in a coronary artery cause sudden death? 6. What is the function of the intrinsic conduction system of the heart? 7. To which heart chambers do the terms systole and diastole usually apply? 8. What causes the lub-dub sounds heard with a stethoscope? 9. What does the term cardiac output mean? 10. What would you expect to happen to the heart rate of an individual with a fever? Why? 11. What is the most important factor affecting stroke volume? 12. Assume you are viewing a blood vessel under the microscope. It has a lopsided lumen, relatively thick externa, and a relatively thin media. Which kind of blood vessel is this? 13. Arteries lack valves, but veins have them. How is this structural difference related to blood pressure? 14. How is the structure of capillaries related to their function in the body? 15. In what part of the body are the femoral, popliteal, and arcuate arteries found? 16. In what part of the body are the axillary, cephalic, and basilica veins located? 17. Which vessel –hepatic portal vein, hepatic vein, hepatic artery – has the highest content of nutrients after a meal? 18. In what two important ways is the pulmonary circulation different from the systemic circulation? 19. What is the ductus venosus, and what is its function? 20. Which artery is palpated at the wrist? At what groin? At the side of the neck? 21. How does blood pressure change throughout the systemic circulatory pathway? 22. What is the effect of hemorrhage on blood pressure? Why? 23. Would you expect fluid to be entering or leaving the capillaries at the venous end of a capillary bed? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	

<ul style="list-style-type: none"> ○ The path blood takes in traveling between the systemic and pulmonary circulation ○ The various parts of the circulatory system ○ The structure and function of the human heart ○ The hormones associated with the circulatory system and their effects ○ The effect exercise has on the body ○ How the heart functions to pump blood ○ How blood pressure is taken manually 	<ul style="list-style-type: none"> ○ Describe the location of the heart in the body and identify its major anatomical areas on an appropriate model or diagram. ○ Trace the pathway of blood through the heart. ○ Compare the pulmonary and systemic circuits. ○ Explain the operation of the heart valves. ○ Name the functional blood supply of the heart. ○ Name the elements of the intrinsic conduction system of the heart and describe the pathway of impulses through this system. ○ Define systole, diastole, stroke volume, and cardiac cycle. ○ Define heart sounds and murmur. ○ Explain what information can be gained from an electrocardiogram. ○ Describe the effect of the following on heart rate: stimulation by the vagus nerve, exercise, epinephrine, and various ions. ○ Compare and contrast the structure and function of arteries, veins, and capillaries. ○ Identify the body's major arteries and veins and name the body region supplied by each. ○ Discuss the unique features of special circulations of the body: arterial circulation of the brain, hepatic portal circulation, and fetal circulation. ○ Define blood pressure and pulse and name several pulse points. ○ List factors affecting and/or determining blood pressure. ○ Define hypertension and atherosclerosis and describe possible health consequences of these conditions. ○ Describe the changes that occur across capillary walls. ○ Describe briefly the development of the cardiovascular system. ○ Name the fetal vascular modifications, or "fetal shunts," and describe their function before birth. ○ Explain how regular exercise and a diet low in fats and cholesterol may help maintain cardiovascular health
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 12 Lesson Plan – The Lymphatic System & Body Defenses

Teacher:	SBOE Faculty	Time Frame:	9 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes		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)	
Essential Questions			
<ol style="list-style-type: none"> 1. What is the function of lymphatic vessels? 2. How do lymphatic capillaries and blood capillaries differ structurally from each other? 3. In which three regions of the body are the lymph nodes most dense? 4. What anatomical characteristic ensures that lymph flows through the lymph nodes slowly? 5. Which lymphoid organ gets rid of aged red blood cells? 6. What is MALT? 7. How do the innate and adaptive defenses differ? 8. What are the four common indicators of inflammation? 9. How does complement cause lysis of a pathogenic microorganism? 10. Which type of infectious microorganism causes the body's level of interferons to rise? 11. What is the difference between an antigen and a self-antigen? 12. What are the two types of lymphocytes involved in adaptive immune responses, and how do their functions differ in body protection differ? 13. Where does the “programming” phase leading to immunocompetence occur for T cells? 14. What is the essential role of macrophages and dendritic cells in adaptive immunity? 15. The concentration of antibodies in John's lymphatic stream is increasing rapidly. Which cells would you expect to be increasing in number – B cells, plasma cells, or T cells? 16. Which class of antibody is found saliva and tears? 17. Regarding the action of antibodies, what is neutralization? 18. T cells must take part in what is sometimes called the double handshake in order to be activated. What does this mean? 19. How is the lethal hit accomplished? 20. What is the role of regulatory T cells in the adaptive immune response? 21. Sheila is receiving a kidney transplant. The donor is her fraternal twin. What name is given to this type of graft? 22. What is an allergy? 23. What causes the difficulty in breathing seen in anaphylactic shock? 24. What is the principal problem common to all immunodeficiency diseases? 25. What are two possible causes of autoimmune disease? 			
Knowledge & Skills			

<p>By the end of this unit, students will know:</p> <ul style="list-style-type: none"> ○ The structure and function of the lymphatic system ○ The organs associated with the lymphatic system ○ The steps of the inflammatory process ○ The intricacies of the immune response ○ The various parts of the blood involved with immune response 	<p>By the end of this unit, students will be able to:</p> <ul style="list-style-type: none"> ○ Name the two major types of structures composing the lymphatic system and explain how the lymphatic system is functionally related to the cardiovascular and immune systems. ○ Describe the composition of lymph and explain its formation and transport. ○ Describe the function(s) of lymph nodes, tonsils, the thymus, Peyer’s patches, and the spleen. ○ Describe the protective functions of the skin and mucous membranes. ○ Explain the importance of phagocytes and natural killer cells. ○ Describe the inflammatory process. ○ Name several antimicrobial substances produced by the body that act in a nonspecific body defense. ○ Explain how fever helps protect the body against invading bacteria. ○ Define antigen and hapten, and name substances that act as complete antigens. ○ Name the two arms of the immune response and relate each to a specific lymphocyte type (B or T cell). ○ Compare and contrast the development of B and T cells. ○ State the roles of B cells, T cells, and plasma cells. ○ Explain the importance of macrophages in immunity. ○ List the five antibody classes and describe their specific roles in immunity. ○ Describe several ways in which antibodies act against antigens. ○ Distinguish between active and passive immunity. ○ Describe immunodeficiencies, allergies, and autoimmune diseases. ○ Describe the origin of the lymphatic vessels. ○ Describe the effects of aging on immunity.
Assessment	
<p>During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.</p>	

Chapter 13 Lesson Plan – The Respiratory System

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		

NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	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)
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Essential Questions

1. Why is nose breathing preferable to mouth breathing?
2. What is the specific protective function of the cilia in the trachea?
3. What is the order of the following parts of the human respiratory system from the site where air enters nostrils to the site where air reaches the end passages of the lungs – bronchi, larynx, nasal cavity, alveoli, trachea, pharynx, bronchioles?
4. Which main bronchus is the most likely site for an inhaled object to become lodged? Why?
5. The lungs are the most likely site for an inhaled object to become lodged? Why?
6. The lungs are mostly passageways and elastic tissue. What is the role of the passageways? Of the elastic tissue?
7. Name the four structures that make up the respiratory zone.
8. What is the most basic function of respiration?
9. What causes air to flow out of the lungs during expiration?
10. Which is the largest respiratory volume – ERV, IRV, TV, or VC? Which is the smallest?
11. Dead space volume accounts for about 150 ml of tidal volume. How much of the tidal breath actually reaches the exchange chambers (alveoli)?
12. Which type of cellular transport moves respiratory gases between the blood and the body’s cells?
13. What is the major form in which CO₂ is transported in the blood?
14. What is cyanosis?
15. Which brain area is most important in setting the basic respiratory rate and rhythm?
16. What chemical factor in blood normally provides the most powerful stimulus to breathe?
17. What happens to the alveoli if surfactant is not produced in a newborn baby? What name is given to this condition?

Knowledge & Skills

By the end of this unit, students will know: <ul style="list-style-type: none"> o The intricacies of the respiratory system o How respiration occurs o The structure and function of the respiratory system o How the brain controls respiration o Factors that influence respiratory rate o Diseases associated with the respiratory system 	By the end of this unit, students will be able to: <ul style="list-style-type: none"> o Name the organs forming the respiratory passageway from the nasal cavity to the alveoli of the lungs (or identify them on a diagram or model) and describe the function of each. o Describe several protective mechanisms of the respiratory system. o Describe the structure and function of the lungs and the pleural coverings. o Define cellular respiration, external respiration, internal respiration, pulmonary ventilation, expiration, and inspiration.
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- Explain how the respiratory muscles cause volume changes that lead to air flow into and out of lungs (breathing).
- Define the following respiratory volumes: tidal volume, vital capacity, expiratory reserve volume, inspiratory reserve volume, and residual air.
- Name several non-respiratory air movements and explain how they modify or differ from normal respiratory air movements.
- Describe the process of gas exchanges in the lungs and tissues.
- Describe how oxygen and carbon dioxide are transported in the blood.
- Name the brain areas involved in control of respiration.
- Name several physical factors that influence respiratory rate.
- Explain the relative importance of oxygen and carbon dioxide in modifying the rate and depth of breathing.
- Explain why it is not possible to stop breathing voluntarily.
- Define apnea, dyspnea, hyperventilation, hypoventilation, and chronic obstructive pulmonary disease (COPD).
- Describe the symptoms and probable causes of COPD and lung cancer.
- Describe normal changes that occur in respiratory system functioning from infancy to old age.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 14 Lesson Plan – The Digestive System

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p> <p>Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (HS-LS1-7)</p>		
Essential Questions			
<ul style="list-style-type: none"> ● What is the sequential order (mouth to anus) of the digestive organs making up the alimentary canal? ● In which organ of the alimentary canal does protein digestion begin? ● What is the function of the stomach secretions alkaline mucus and instinsic factor? ● Which muscular sphincter regulates the flow of chyme into the small intestine? ● What are villi, and why are they important? ● What are the two main functions of the large intestine? ● What is the normal number of permanent teeth? ● What is the digestive role of bile? What organ secretes bile? ● Only one organ produces enzymes capable of digesting all groups of food. Which organ is this? ● What is the proper order of the following stages of food processing – defecation, absorption, digestion, ingestion? ● How do mechanical and chemical digestion differ from each other? ● What happens during the buccal stage of swallowing? ● How does segmentation differ from peristalsis in terms of moving substances along the GI tract? ● What does it mean when we say that food “went down the wrong tube”? ● Why is it necessary for the stomach contents to be so acidic? ● What are the building blocks (and digestion products) of proteins? ● What is the role of CKK in digestion? ● What are brush border enzymes? ● What is the major source of carbohydrates in our diet? ● Why is it important to include cellulose in a healthy diet even though we cannot digest it? ● Are oils saturated lipids or unsaturated lipids? ● What is the most significant role that vitamins play in the body? ● What name is given to the process in which glucose is combined with oxygen to yield CO₂, H₂O, and ATP? 			

- What are the major end products of the Krebs cycle?
- What are the major products of the electron transport chain?
- Other than for ATP production, list two issues of fats in the body?
- What happens to the ammonia released when two amino acids are “burned” for energy?
- What is gluconeogenesis?
- If you had your choice, would you prefer to have high blood levels of HDLs or LDLs? Explain your answer.
- Which of the following would you expect to yield a relatively high BMR: old age, large surface area relative to body volume, female sex, deficient thyroxine production?
- What are the two means of either maintaining or increasing body temperature?
- How does vasodilation of skin blood vessels affect body temperature on a hot day?
- How does cystic fibrosis affect digestion?
- What dietary changes must be made to prevent brain damage in children with PKU?
- What occurs when your total caloric intake exceeds your TMR?

Knowledge & Skills

By the end of this unit, students will know:

- Know the intricacies of the digestive system
- Describe the various parts and organs associated with the digestive system
- How human metabolism occurs
- The parts of a proper diet

By the end of this unit, students will be able to:

- Name the organs of the alimentary canal and accessory digestive organs and identify each on an appropriate diagram or model.
- Identify the overall function of the digestive system as digestion and absorption of foodstuffs, and describe the general activity of each digestive system organ.
- Describe the composition and function(s) of saliva.
- Name the deciduous and permanent teeth and describe the basic anatomy of the tooth.
- Explain how villi aid digestive processes in the small intestine.
- Describe the mechanisms of swallowing, vomiting, and defecation.
- Describe how foodstuffs in the digestive tract are mixed and moved along the tract.
- Describe the function of local hormones in the digestive process.
- List the major enzymes or enzyme groups produced by the digestive organs or accessory glands and name the foodstuffs on which they act.
- Name the end products of protein, fat, and carbohydrate digestion.
- State the function of bile in the digestive process.
- Define nutrient and calorie.
- List the six major nutrient categories. Note important dietary sources and the principal cellular uses of each.
- Define enzymes, metabolism, anabolism, and catabolism.
- Describe the metabolic roles of the liver.
- Recognize the sources of carbohydrates, fats, and proteins and their uses in cell metabolism.
- Explain the importance of energy balance in the body and indicate consequences of energy imbalance.

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| | <ul style="list-style-type: none">○ List the several factors that influence metabolic rate, and indicate the effect of each.○ Describe how body temperature is regulated.○ Name important congenital disorders of the digestive system and significant inborn errors of metabolism.○ Describe the effect of aging on the digestive system. |
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 15 Lesson Plan – The Urinary System

Teacher:	SBOE Faculty	Time Frame:	7 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		
Essential Questions			
<ul style="list-style-type: none"> ● The kidneys are retroperitoneal. What does that mean? ● From the most superficial aspect of a kidney to its ureter, name its three major regions. ● What is the structural and functional unit of the kidney? ● What are two functions of the renal tubule and one function of the peritubular capillaries? ● How does a decrease in blood pressure affect glomerular pressure? ● Is specific gravity of urine higher or lower than that of water? Why? ● A kidney stone blocking a ureter would interfere with the flow of urine to which organ? ● Why is the presence of transitional epithelium in the urinary bladder important? ● Structurally and functionally, how does the male urethra differ from the female urethra? ● What is a synonym for micturition? ● What are the four main functions of the kidneys? ● What is the chief mechanism prompting water intake? ● What is the role of aldosterone in water balance? ● Where are osmoreceptors located, and to what stimulus do they respond? ● Why is blood pH in the range 7.0-7.35 considered acidic even though chemistry defines any pH >7.0 as basic? ● To minimize the pH shift that occurs when a strong acid is added to water, would it be better to add a strong or a weak base? Why? ● What are the two main ways the kidneys maintain the acid-base balance of the blood? ● What is hypospadias? ● What is urgency as related to the urinary system? What is frequency? ● What accounts for urinary urgency and frequency in elderly people? 			
Knowledge & Skills			
By the end of this unit, students will know:		By the end of this unit, students will be able to:	
<ul style="list-style-type: none"> ○ The structure and function of the urinary system ○ The parts of a kidney and how it functions ○ Diseases associated with the urinary system 		<ul style="list-style-type: none"> ○ Describe the location of the kidneys in the body. ○ Identify the following regions of the kidney (longitudinal section): hilus, cortex, medulla, medullary pyramids, calyces, pelvis, and renal columns. 	

<ul style="list-style-type: none"> ○ The function of the various hormones of the urinary system 	<ul style="list-style-type: none"> ○ Recognize that the nephron is the structural and functional unit of the kidney and describe its anatomy. ○ Describe the function of the kidneys in excretion of nitrogen-containing wastes. ○ Define polyuria, anuria, oliguria, and diuresis. ○ Describe the composition of normal urine. ○ List abnormal urinary components. ○ Describe the general structure and function of the ureters, bladder, and urethra. ○ Compare the course and length of the male urethra to that of the female. ○ Define micturition. ○ Describe the difference in control of the external and internal urethral sphincters. ○ Name three common urinary tract problems. ○ Name and localize the three main fluid compartments of the body. ○ Explain the role of the antidiuretic hormone (ADH) in regulation of water balance by the kidney. ○ Explain the role of aldosterone in sodium and potassium balance of the blood. ○ Compare and contrast the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid-base balance of the blood. ○ Describe three common congenital problems of the urinary system. ○ Describe the effect of aging on urinary system functioning.
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Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Class work and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Chapter 16 Lesson Plan – The Reproductive System

Teacher:	SBOE Faculty	Time Frame:	11 days (depending on class schedule)
Grade:	11-12	School:	High School
Subject:	Human Anatomy & Physiology		
NJSLS/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	<p>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)</p> <p>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)</p>		

Essential Questions

1. What are the two major functions of the testes?
2. What is the role of the seminiferous tubules?
3. Name the organs of the male duct system, in order, from the scrotum to the body exterior.
4. What is the function of the erectile tissue of the penis?
5. What is an important function of each of the two components of semen – sperm and seminal fluid?
6. Adolph, a 68-year-old gentleman, has trouble urinating and is given a rectal exam. What is his most probable condition, and what is the purpose of the rectal exam?
7. Which pituitary hormone stimulates spermatogenesis?
8. How does the final product of meiosis differ from the final product of mitosis?
9. How are nonmotile spermatids converted to functional sperm?
10. Which pituitary hormone prompts testosterone production?
11. Which is the exocrine product of the ovary?
12. Which organ of the female duct system serves as an “incubator” for fetal development? What is the most common site of fertilization?
13. What name is given to an ovarian follicle that is ready or nearly ready to ovulate?
14. Besides the one functional gamete (ovum), what other cell types are produced during oogenesis, and what happens to them?
15. Which anterior pituitary hormone promotes follicle development in the ovary?
16. Which anterior pituitary hormone causes ovulation?
17. Which ovulation hormone can be called a feminizing hormone because it promotes the formation of female secondary characteristics?
18. What happens during the proliferative stage of the uterine cycle?
19. What are three important functions of progesterone in women?
20. Why do mutations of the BRCA genes cause problems?
21. Explain how pregnancy affects a woman’s respiratory and digestive processes.
22. What are the three stages of labor?
23. Which sex chromosome combination yields a boy – XX or XY? What hormone must be produced by an XY fetus during development to stimulate its formation of the male duct system?
24. What is cryptorchidism, and what results if it is not rectified?
25. What are the major health threats to the adult woman’s reproductive system?

Knowledge & Skills

By the end of this unit, students will know:

- The purpose of having reproductive organs
- The structure and functions of various reproductive organs
- The workings of the reproductive system

By the end of this unit, students will be able to:

- Discuss the purpose of the reproductive system organs.
- When provided with a model or diagram, identify the organs of the male reproductive system and discuss the general function of each.
- Name the endocrine and exocrine products of the testes.
- Discuss the composition of semen and name the glands that produce it.
- Trace the pathway followed by a sperm from the testis to the body exterior.
- Define erection, ejaculation, and circumcision.
- Define meiosis and spermatogenesis.
- Describe the structure of a sperm and relate its structure to its function.
- Describe the effect of FSH and LH on testis functioning.
- When provided with a model/diagram, identify the organs of the female reproductive system and discuss the general function of each.
- Describe the functions of the vesicular follicle and corpus luteum of the ovary.
- Define endometrium, myometrium, and ovulation.
- Indicate the location of the following regions of the female uterus: cervix, fundus, body.
- Define oogenesis.
- Describe the influence of FSH and LH on ovarian function.
- Describe the phases and controls of the menstrual cycle.
- Describe the structure and function of the mammary glands.
- Define fertilization and zygote.
- Describe implantation.
- Distinguish between an embryo and a fetus.
- List the major functions of the placenta.
- Indicate several ways that pregnancy alters or modifies the functioning of the mother's body.
- Describe how labor is initiated. Discuss the 3 stages of labor
- List agents that can interfere with normal fetal development.
- Describe the importance of the presence/absence of testosterone during embryonic development of the reproductive system organs.
- Define menarche and menopause.
- List common reproductive system problems seen in adult and aging males and females.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.