Garfield High School
Aligned to the 2009 New Jersey Core Curriculum Content Standards
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Garfield Public Schools
Science Curriculum
Anatomy and Physiology

Revision Committee:
Ms. Jennifer Botten

Final Revision Date: August 31, 2011

Garfield Board of Education
Dr. Kenneth Conte- President
Mr. Tony Lio - Vice President
Mrs. Rose Marie Aloia
Mr. Anthony Barckett
Mr. Salvatore Benanti
Mr. Richard Giacomarro
Dr. Donna M. Koch
Mr. Nikolce Milevski
Mr. Edward Puzio

Administration
Mr. Nicholas Perrapato, Superintendent
Mr. Tom Egan, Business Administrator / Board Secretary

Curriculum Supervisor
Mrs. Alexandra Bellenger

Assistant Curriculum Supervisor – Science
Ms. Jennifer Botten

Board Adoption Date – September 26, 2011
Resolution # - 09-137-11
Course Description

This rigorous college-preparatory elective science course includes a detailed study of many human body systems. Homeostatic balance, the relationship between structure and function, and the interrelationships between body systems are a focus throughout the course. This course is recommended for students interested in a health-related career, especially those students who plan to study medicine, nursing, physical therapy, and athletic training. The course may also be helpful for those students who plan to enter education as either a life-science or physical education teacher. Laboratory activities will include several microscopic analyses of tissue specimens as well as several dissections to accompany the subject matter.

Prerequisites

Students who plan to enroll in the Human Anatomy and Physiology course must have successfully completed one year of biology and one year of chemistry.
Contents

Unit Title: The Human Body – An Orientation

Duration: 2 weeks or 5 blocks

Basic themes run throughout the course of this class. This unit serves to introduce the students to the basic functions of living organisms, reviews the concept of homeostasis and introduces positive and negative feedback systems in response to homeostatic regulation. Also included in this unit are the anatomical terms to describe body sections, body regions, and relative positions. These terms will be extremely important to the study of anatomy and physiology.

Unit Title: Tissues

Duration: 2 weeks or 5 blocks

Humans are a multicellular organism, therefore, no single cell can single handedly run the body. Through differentiation, each cell becomes specialized to handle a small range of functions. Cells that have the same basic functions combine to form tissues. This unit addresses the different types of tissues and their structure and functions.

Unit Title: The Integumentary System

Duration: 3 weeks or 6-7 blocks

The skin and its derivatives (sweat and oil glands, hair and nails) make up a complex set of organs that serves several functions, mainly protective, but the integumentary system also plays a large role in homeostasis and sensory reception. This unit will address the main components of this system and how they function to fulfill the five major roles they play.

Unit Title: The Skeletal System

Duration: 3 weeks or 6-7 blocks

The human body would not have a shape without the skeletal system, nor would it be able to support its own weight. Bones also work with the muscles to maintain position and produce movement. The unit begins with a look at the different types of bone tissue, an overview of how bone grows and repairs itself, and then focuses on the bones of the axial and appendicular skeleton.

Unit Title: The Muscular System

Duration: 4 weeks or 8-9 blocks

Movement, blood flow, breathing, and digestion cannot occur without muscle tissue. The unit begins with skeletal muscle tissue, and then an account of smooth and cardiac muscle tissue. There is a focus on the physiology of the muscle tissues as well.

Unit Title: Nervous and Endocrine Systems

Duration: 4 weeks or 8-9 blocks

The nervous system is the system that maintains total control over the entire body and serves as the hub of its communication. Every action, emotion, and thought is reflected in the activity of this system.
Unit Title: The Cardiovascular System

Duration: 4 weeks or 8-9 blocks

Although the heart is easily the most recognizable organ and essential to life, it cannot work alone. The organs of the cardiovascular system work together to keep the blood continually circulating in an effort to maintain homeostasis.

Unit Title: Lymphatic and Immune System

Duration: 2 weeks or 5 blocks

Although the lymphatic system is not one of the first body systems that comes to mind, it is essential for the proper functioning of the entire body. It plays an essential role as a defender of the body from pathogens and in building resistance to disease.

Unit Title: The Respiratory System

Duration: 3 weeks or 6-7 blocks

The respiratory system shoulders some of the responsibility along with the cardiovascular system for supplying the body with oxygen and disposing of carbon dioxide. The organs of the respiratory system are specifically involved in the gas exchanges that occur between the blood and cells and the blood and the external environment.

Unit Title: The Digestive System

Duration: 3 weeks or 6-7 blocks

This unit concentrates on the functioning of the digestive and excretory systems. While the digestive system is vital for breaking down food into nutrient molecules and absorbing them into the blood stream, the excretory system is equally important in ridding the body of wastes.

Unit Title: The Urinary System

Duration: 2 weeks or 5 blocks

The urinary system is essential for maintaining homeostasis by regulating water balance, electrolytes, and the pH of the blood, while also ridding the body of nitrogenous wastes.

Unit Title: The Reproductive System

Duration: 3 weeks or 6-7 blocks

The reproductive system ensures the continuity of the species by producing offspring.
## Unit Overview

**Content Area:** Science  
**Unit Title:** The Human Body – An Orientation  
**Target Course/Grade Level:** Anatomy & Physiology / Grades 11-12  
**Duration:** 2 weeks or 5 blocks

### Description
Basic themes run throughout the course of this class. This unit serves to introduce the students to the basic functions of living organisms, reviews the concept of homeostasis and introduces positive and negative feedback systems in response to homeostatic regulation. Also included in this unit are the anatomical terms to describe body sections, body regions, and relative positions. These terms will be extremely important to the study of anatomy and physiology.

### Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure and Function</td>
<td>Structure dictates function in the body.</td>
</tr>
<tr>
<td>Homeostasis</td>
<td>Homeostasis works in all systems to keep the body in balance.</td>
</tr>
<tr>
<td>Anatomical Terminology</td>
<td>Proper terminology is needed for universal accurate communication.</td>
</tr>
</tbody>
</table>

### Learning Targets

**CPI Codes**
- 5.1.12.D.1  
- 5.1.12.D.2  
- 5.1.12.D.3

### 21st Century Themes and Skills

**Themes**
- Global Awareness  
- Health Literacy

**Skills**
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

### Guiding Questions
- What are the functions of living organisms?  
- What is the relationship between anatomy and physiology?  
- What are some specialties of each discipline?  
- What are the major levels of organization in living organisms?  
- What are the 11 major organ systems and their components?  
- What is homeostasis?  
- How are positive and negative feedback involved in homeostasis?  
- Why is it important to use the correct anatomical terms?  
- What are the major body cavities and their subdivisions?

### Unit Results

Anatomy & Physiology The Human Body: An Orientation
<table>
<thead>
<tr>
<th>Students will ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Describe the functions of living organisms.</td>
</tr>
<tr>
<td>● Explain the relationship between anatomy and physiology, and describe various specialties of each discipline.</td>
</tr>
<tr>
<td>● Identify the major levels of organization in living organisms.</td>
</tr>
<tr>
<td>● Identify the 11 organ systems of the human body and the major components of each.</td>
</tr>
<tr>
<td>● Explain the concept of homeostasis.</td>
</tr>
<tr>
<td>● Describe how negative feedback and positive feedback are involved in homeostatic regulation.</td>
</tr>
<tr>
<td>● Use anatomical terms to describe body sections, body regions, and relative positions.</td>
</tr>
<tr>
<td>● Identify the major body cavities and their subdivisions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suggested Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The following activities can be incorporated into the daily lessons:</strong></td>
</tr>
<tr>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The following experiments should be included into the daily lessons.</strong></td>
</tr>
<tr>
<td>●</td>
</tr>
</tbody>
</table>
# Anatomy & Physiology – Tissues

## Unit Overview

**Content Area:** Science  
**Unit Title:** Tissues  
**Target Course/Grade Level:** Anatomy & Physiology / Grades 11-12  
**Duration:** 2 weeks or 5 blocks

### Description

Humans are a multicellular organism, therefore, no single cell can single handedly run the body. Through differentiation, each cell becomes specialized to handle a small range of functions. Cells that have the same basic functions combine to form tissues. This unit addresses the different types of tissues and their structure and functions.

### Concepts & Understandings

#### Concepts
- Cellular organization
- Differentiation

#### Understandings
- All tissues develop from simple layers in the embryo starting from stem cells.
- Stem cells are important because they have the potential to become any kind of cell.
- Depending on their structure, tissues provide a division of labor for the body's work.

### Learning Targets

#### CPI Codes
- 5.3.12.A.1
- 5.3.12.A.4
- 5.3.12.A.6

### 21st Century Themes and Skills

#### Themes
- Global Awareness
- Health Literacy

#### Skills
- Critical Thinking and Problem Solving Skills
- Communication and Collaboration Skills
- ICT Literacy
- Life and Career Skills

### Guiding Questions

- What are the four basic tissues types and what is their role?  
- What are the different types of epithelial cells and their functions?  
- What is the relationship between the form and function of each type of epithelium?  
- What are the structure and functions of each type of connective tissue?  
- How do epithelial and connective tissues combine to form the four types of membranes?  
- What are the three types of muscles tissue and how can you tell them apart?  
- What is the basic structure and role of neural tissue?  
- How do injuries affect the tissues of the body?  
- How does aging affect the tissues of the body?
## Unit Results

**Students will ...**

- Identify the body’s four basic tissue types and describe their roles.
- Discuss the types and functions of epithelial cells.
- Describe the relationship between form and function for each type of epithelium.
- Compare the structures and functions of the various types of connective tissues.
- Explain how epithelial and connective tissues combine to form four types of membranes, and specify the functions of each.
- Describe the three types of muscle tissue and the distinctive structural features of each.
- Discuss the basic structure and role of neural tissue.
- Explain how injuries affect the tissues of the body.
- Explain how aging affects the tissues of the body.

## Suggested Activities

**The following activities can be incorporated into the daily lessons:**

- 

## Laboratory Experiments

**The following experiments should be included into the daily lessons.**

- Students will view normal, abnormal and unknown tissue specimens under the microscope sketching and answering questions based on their findings
# Unit Overview

**Content Area:** Science  
**Unit Title:** The Integumentary System  
**Target Course/Grade Level:** Anatomy & Physiology / Grades 11-12  
**Duration:** 3 weeks or 6-7 blocks

**Description**  
The skin and its derivatives (sweat and oil glands, hair and nails) make up a complex set of organs that serves several functions, mainly protective, but the integumentary system also plays a large role in homeostasis and sensory reception. This unit will address the main components of this system and how they function to fulfill the five major roles they play.

## Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multicellular organization</td>
<td>The epidermis is composed of layers with various functions.</td>
</tr>
<tr>
<td>Homeostasis</td>
<td>Epidermal pigmentation and dermal circulation influence skin color.</td>
</tr>
<tr>
<td></td>
<td>Sweat and oil glands are exocrine glands located in the skin.</td>
</tr>
<tr>
<td></td>
<td>Hair is made of keratinized dead cells.</td>
</tr>
<tr>
<td></td>
<td>Nails are keratinized epidermal cells that protect the fingers and toes.</td>
</tr>
</tbody>
</table>

## Learning Targets

**CPI Codes**  
- 5.3.12.A.3  
- 5.3.12.A.6

## 21st Century Themes and Skills

**Themes**  
- Global Awareness  
- Health Literacy  

**Skills**  
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

## Guiding Questions

- What tissue types make up the epidermis and dermis?  
- What are the major layers of the epidermis and dermis?  
- What are the functions of each layer of the epidermis and dermis?  
- What contributes to skin color?  
- What is the structure and location of the sweat and oil glands?  
- What is the composition and function of the secretions of the sweat and oil glands?  
- What are the similarities and differences between the eccrine and appocrine glands?  
- What are the parts of the hair follicle and their functions?
What are the regions of hair?
What is the basis of hair color?
What is the structure of nails?
What are the characteristics of the three major types of skin cancer?
Why are serious burns life threatening?
How do you determine the extent of a burn?
What is the difference between a first, second, and third degree burn?

Unit Results

Students will ...

- 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 and locations of sweat and oil glands. Also compare the composition and functions of their secretions.
- Compare and contrast eccrine and apocrine glands.
- List the parts of a hair follicle and explain the function of each part.
- Name the regions of a hair and explain the basis of hair color.
- Describe the structure of nails.
- Summarize the characteristics of the three major types of skin cancers.
- Explain why serious burns are life threatening. Describe how to determine the extent of a burn and differentiate between first, second, and third degree burns.

Suggested Activities

The following activities can be incorporated into the daily lessons:

- 

Laboratory Experiments

The following experiments should be included into the daily lessons.

- 

Anatomy & Physiology – The Integumentary System
## Unit Overview

**Content Area:** Science  
**Unit Title:** The Skeletal System  
**Target Course/Grade Level:** Anatomy & Physiology / Grades 11-12  
**Duration:** 3 weeks or 6-7 blocks

### Description
The human body would not have a shape without the skeletal system, nor would it be able to support its own weight. Bones also work with the muscles to maintain position and produce movement. The unit begins with a look at the different types of bone tissue, an overview of how bone grows and repairs itself, and then focuses on the bones of the axial and appendicular skeleton.

## Concepts & Understandings

### Concepts
- Structure and Function

### Understandings
- Bone cells and tissue structures have certain structures and functions.
- Axial and appendicular segments of the skeleton have important roles for the body.
- Prognosis and treatment for fractures depends on fracture type, age and health of the individual.
- Joints have different compositions and shapes enabling varying levels of mobility.

## Learning Targets

### CPI Codes
- 5.3.12.A.6

## 21st Century Themes and Skills

### Themes
- Global Awareness  
- Health Literacy

### Skills
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

## Guiding Questions
- What is the structure and function of bone tissue?  
- What are the subdivisions of the skeletal system?  
- What bones make up the axial skeleton? The appendicular skeleton?  
- What are the four main types of bones and their related functions?  
- What are the main types of fractures?  
- What bones make up the shoulder and pelvic girdles?  
- What are the similarities and differences between the male and female pelvis?
### Anatomy & Physiology – The Skeletal System

#### Unit Results

**Students will ...**
- Explain bone tissue structure and functions.
- Identify the subdivisions of the skeleton as either axial or appendicular.
- Analyze the four main types of bones and their related functions.
- Describe and analyze the prognosis for the main types of fractures.
- Identify on a skeleton or diagram the bones of the shoulder and pelvic girdles and their attached limbs.
- Compare and contrast the structure of the male and female pelvis.

#### Suggested Activities

**The following activities can be incorporated into the daily lessons:**
- Students will articulate a human skeleton.
- Students will interpret x-rays which will include identification of fractures, joints, and their appropriate bone locations.

#### Laboratory Experiments

**The following experiments should be included into the daily lessons.**
- 
## Unit Overview

**Content Area:** Science  

**Unit Title:** The Muscular System  

**Target Course/Grade Level:** Anatomy & Physiology / Grades 11-12  

**Duration:** 4 weeks or 8-9 blocks  

**Description**  
Movement, blood flow, breathing, and digestion cannot occur without muscle tissue. The unit begins with skeletal muscle tissue, and then an account of smooth and cardiac muscle tissue. There is a focus on the physiology of the muscle tissues as well.

## Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure and Function</td>
<td>The three muscle types have a unique structure and function.</td>
</tr>
<tr>
<td>Metabolism</td>
<td>Muscle contraction is a complex series of steps in a cascade.</td>
</tr>
<tr>
<td></td>
<td>Muscles can be named for their location, their fiber direction or how they are arranged.</td>
</tr>
<tr>
<td></td>
<td>Muscle fatigue is linked to several factors including how fuel is broken down in the body.</td>
</tr>
</tbody>
</table>

## Learning Targets

| CPI Codes |  
|-----------|---|
| 5.3.12.A.6 |  

## 21st Century Themes and Skills

**Themes**  
- Global Awareness  
- Health Literacy  

**Skills**  
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills  

## Guiding Questions

- What is the structure and function of the three types of muscle tissue?  
- Where is each type of muscle tissue found?  
- What is the role of actin and myosin containing filaments?  
- What are the key steps involved in the contraction of skeletal muscle fiber?  
- How are muscles named?  
- What are the similarities of aerobic and anaerobic endurance?  
- What is muscle fatigue?  

## Unit Results

*Students will...*  
- Compare and contrast the structure and function of the three types of muscle 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.
- Explain the key steps involved in the contraction of a skeletal muscle fiber.
- List some criteria used in naming muscles.
- Compare and contrast aerobic and anaerobic endurance, including muscle fatigue, and explain its implications for muscle performance.

### Suggested Activities

**The following activities can be incorporated into the daily lessons:**
- Students will analyze muscle tissue specimens under the microscope. They will sketch and interpret their findings as well as answer questions.
- Students will create a model of the muscle demonstrating the macroscopic structures and layers.

### Laboratory Experiments

**The following experiments should be included into the daily lessons.**
- Muscle Fatigue Lab. The purpose of the experiment is to determine which factors influence muscle fatigue. Students design and conduct an experiment to test their hypothesis, record and interpret data and draw conclusions.
- Chicken wing dissection demonstrating tendons, ligaments and muscle movements.
## Unit Overview

### Content Area:
Science  

### Unit Title:
Nervous and Endocrine Systems  

### Target Course/Grade Level:
Anatomy and Physiology / Grades 11-12  

### Duration:
4 weeks or 8-9 blocks  

### Description
The nervous system is the system that maintains total control over the entire body and serves as the hub of its communication. Every action, emotion, and thought is reflected in the activity of this system.

### Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Structure and Function</td>
<td>• The nervous system maintains body homeostasis through sensation, interpretation, response and activity.</td>
</tr>
<tr>
<td>• Homeostasis</td>
<td>• Nerve cells send electrical signals for communication.</td>
</tr>
<tr>
<td>• Cellular Transport</td>
<td>• Reflexes help protect our bodies from harm and can be tested.</td>
</tr>
<tr>
<td>• Response to Stimuli</td>
<td>• Nerves interpret incoming impulses and act with outgoing impulses.</td>
</tr>
<tr>
<td></td>
<td>• The eye is a complicated organ which sends visual impulses to the brain for interpretation.</td>
</tr>
</tbody>
</table>

### CPI Codes

- 5.3.12.A.6

### 21st Century Themes and Skills

#### Themes
- Global Awareness  
- Health Literacy

#### Skills
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

### Guiding Questions

- What are the general functions of the nervous system?  
- What is the general structure of the neuron?  
- What events lead to the generation of a nerve impulse and its conduction from one neuron to another?  
- What is a reflex arc?  
- What are the different types of motor responses?  
- What are the functions of the central, peripheral, autonomic, and somatic systems?  
- What are the effects of the parasympathetic and sympathetic divisions on several organs?  
- What is the difference between hormonal and neural control of body functions?  
- What are the major endocrine organs and where are they located?
Anatomy & Physiology – The Nervous and Endocrine Systems

### What is the difference between hormones, paracines, and autocrines?

### How do you chemically classify hormones?

### What are the two major mechanisms by which hormones bring about their effects on their target tissues?

### How is hormone release regulated?

### What are the structural and functional relationships between the hypothalamus and the pituitary gland?

### What are the important effects of the two groups of hormones produced by the thyroid gland?

### What are the general functions of parathyroid hormones?

### What are some hormones produced by the adrenal gland, and cite their physiological effects?

### What is the importance of melatonin?

### What effect does aging have on endocrine system function?

#### Unit Results

**Students will ...**

- List the general functions of the nervous system
- Describe the general structure of the neuron and name its important anatomical regions.
- Interpret the events that lead to the generation of a nerve impulse and its conduction from one neuron to another.
- Define a reflex arc and list its elements.
- Distinguish between the types of motor responses produced by various reflexes.
- Explain the function of the various divisions of the nervous system including central, peripheral, autonomic, and somatic systems.
- Contrast the effect of the parasympathetic and sympathetic divisions on several organs.
- Analyze the accessory and internal structures of the eye.
- Indicate important differences between hormonal and neural controls of body functioning.
- List the major endocrine organs, and describe their body locations.
- Distinguish between hormones, paracines, and autocrines.
- Describe how hormones are classified chemically.
- Describe the two major mechanisms by which hormones bring about their effects on their target tissues.
- Explain how hormone release is regulated.
- Describe structural and functional relationships between the hypothalamus and the pituitary gland.
- Describe important effects of the two groups of hormones produced by the thyroid gland.
- Indicate general functions of parathyroid hormone.
- List hormones produced by the adrenal gland, and cite their physiological effects.
- Briefly describe the importance of melatonin.
- Describe the effect of aging on endocrine system functioning.

#### Suggested Activities

**The following activities can be incorporated into the daily lessons:**

- Reflex Activity - Students will explore different motor responses elicited by various reflexes.
- Vision Activity – students will explore various optical illusions including the blind spot test, Benham’s disk and others.
- Folic Acid Public Health Campaign: Students can create a commercial educating the public regarding the prevention of neural tube defects with folic acid.

#### Laboratory Experiments

**The following experiments should be included into the daily lessons.**

- Reaction Time Lab – explore reaction time (ruler drop) under different conditions including dominant vs. non-dominant hand, blind call, partner hold etc.
• External and internal sheep brain dissection.
• Cow eye dissection.
### Unit Overview

**Content Area:** Science  
**Unit Title:** The Cardiovascular System  
**Target Course/Grade Level:** Anatomy and Physiology / Grades 11-12  
**Duration:** 4 weeks or 8-9 blocks

**Description**  
Although the heart is easily the most recognizable organ and essential to life, it cannot work alone. In an effort to maintain homeostasis, the organs of the cardiovascular system work together to keep the blood continually circulating.

### Concepts & Understandings

**Concepts**  
- Structure and Function  
- Homeostasis  

**Understanding**  
- Blood normally flows in one direction through chambers and valves.  
- Electrical signals flow through the heart to control its contractions.  
- Heart sounds are created from the opening and closing of different valves during the heart cycle.  
- Arteries and veins each have a special structure and function.  
- Blood pressure can be affected by several factors.  
- The heart goes through radical changes from fetal circulation to adult at birth.

### Learning Targets

**CPI Codes**  
- 5.3.12.A.6

### 21st Century Themes and Skills

**Themes**  
- Global Awareness  
- Health Literacy  

**Skills**  
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

### Guiding Questions

- What is the pathway of blood flow through the heart?  
- What are the major blood vessels and heart valves?  
- What is the conducting system of the heart?  
- What is an electrocardiogram?  
- What is the cardiac cycle?  
- What is atrial and ventricular systole and diastole?
### Unit Results

**Students will ...**

1. Trace the flow of blood through the heart, identifying the major blood vessels, chambers and heart valves.
2. Analyze the components and functions of the conducting system of the heart.
3. Interpret the electrical events associated with an electrocardiogram.
4. Explain the events of a cardiac cycle, including atrial and ventricular systole and diastole, and relate heart sounds to specific events in this cycle.
5. Monitor and predict the effect of various factors on blood pressure.
6. Describe the fetal vascular modifications and explain their function before birth.

### Suggested Activities

**The following activities can be incorporated into the daily lessons:**

- EKG recording and interpretation using Pasco Technology and the computer.

### Laboratory Experiments

**The following experiments should be included into the daily lessons.**

- External and internal sheep heart dissection.
- Student cardio fitness laboratory assessing blood pressure and pulse.
Garfield High School
Aligned to the 2009 New Jersey Core Curriculum Content Standards
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Overview

Content Area: Science
Unit Title: Lymphatic and Immune System
Target Course/Grade Level: Anatomy and Physiology / Grades 11-12
Duration: 2 weeks or 5 blocks

Description
Although the lymphatic system is not one of the first body systems that comes to mind, it is essential for the proper functioning of the entire body. It plays an essential role as a defender of the body from pathogens and in building resistance to disease.

Concepts & Understandings

Concepts
- Structure and Function
- Homeostasis

Understandings
- The lymphatic system is made of two parts: 1) a network of vessels that transport fluids back to the blood, and 2) tissues and organs that house phagocytes and lymphocytes which are important in our immune response.
- The body is defended by the innate defense system and the non-specific defense system which together make up the immune system.

Learning Targets

CPI Codes
- 5.3.12.A.6

21st Century Themes and Skills

Themes
- Global Awareness
- Health Literacy

Skills
- Critical Thinking and Problem Solving Skills
- Communication and Collaboration Skills
- ICT Literacy
- Life and Career Skills

Guiding Questions
- What are the two parts of the lymphatic system and their functions?
- What is the source of lymph? How is it formed and transported through the body?
- What is the function of each of the following: lymphatic vessels, lymph nodes, tonsils, the thymus, Peyer’s Patches, and the spleen?
- What is the importance of phagocytes and natural killer cells?
- What is the inflammatory process?
- How does fever help protect the body?
- What are the similarities and differences between B and T cells?
- What is the importance of macrophages?
- What are the five antibody classes and their roles?
- How do antibodies act against antigens?
What is the difference between passive and active immunity?
What are immunodeficiencies, allergies, and autoimmune disease?

**Unit Results**

**Students will ...**
- Identify the two parts of the lymphatic system and explain their functions.
- Describe the source of lymph and its formation and transport.
- Describe the functions of the following: lymphatic vessels, lymph nodes, tonsils, the thymus, Peyer’s Patches, and the spleen.
- Explain how the lymphatic system is necessary for the proper functioning of the cardiovascular and immune systems.
- Describe the protective functions of the skin and mucous membranes.
- Explain the importance of phagocytes and natural killer cells.
- Describe the inflammatory process.
- Describe how fever helps protect the body.
- Compare and Contrast B and T cells.
- Explain the importance of macrophages.
- List the five antibody classes, and describe their specific roles.
- Describe several ways in which antibodies act against antigens.
- Distinguish between passive and active immunity.
- Describe immunodeficiencies, allergies, and autoimmune disease.

**Suggested Activities**

*The following activities can be incorporated into the daily lessons:*

**Laboratory Experiments**

*The following experiments should be included into the daily lessons.*
# Unit Overview

**Content Area:** Science  
**Unit Title:** The Respiratory System  
**Target Course/Grade Level:** Anatomy and Physiology / Grades 11-12  
**Duration:** 3 weeks or 6-7 blocks

## Description

The respiratory system shoulders some of the responsibility along with the cardiovascular system for supplying the body with oxygen and disposing of carbon dioxide. The organs of the respiratory system are specifically involved in the gas exchanges that occur between the blood and cells and the blood and the external environment.

## Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure and Function</td>
<td>Body cells cannot survive without oxygen.</td>
</tr>
<tr>
<td>Homeostasis</td>
<td>The respiratory system cannot function properly without the cardiovascular system and vice versa.</td>
</tr>
<tr>
<td>Diffusion</td>
<td>There are four events that together are known as respiration.</td>
</tr>
<tr>
<td></td>
<td>Oxygen is transported in the blood in two ways.</td>
</tr>
<tr>
<td></td>
<td>The nervous system controls respiratory rhythm, however, to a point, breathing may be controlled unless it interferes with homeostasis.</td>
</tr>
<tr>
<td></td>
<td>Physical, chemical, and emotional factors can all affect respiratory rhythm and depth.</td>
</tr>
<tr>
<td></td>
<td>The major disorders affecting the respiratory system are emphysema, chronic bronchitis, and lung cancer.</td>
</tr>
</tbody>
</table>

## Learning Targets

**CPI Codes**  
- 5.3.12.A.6

## 21st Century Themes and Skills

### Themes
- Global Awareness
- Health Literacy

### Skills
- Critical Thinking and Problem Solving Skills
- Communication and Collaboration Skills
- ICT Literacy
- Life and Career Skills

### Guiding Questions
- What are the organs in the respiratory system?
Anatomy & Physiology – The Respiratory System

- What is the function of each organ in the respiratory system?
- What are the protective mechanisms of the respiratory system?
- What is the structure and function of the lungs and pleural coverings?
- What are the four events in respiration?
- What does volume change have to do with breathing?
- What are the different types of respiratory volumes?
- How does gas exchange occur in the lungs and tissues?
- How are oxygen and carbon dioxide transported in the blood?
- Why can you not voluntarily stop breathing?
- What are some physical, chemical, and emotional factors that affect respiratory rate?
- What are the symptoms and causes of the following respiratory diseases: emphysema, chronic bronchitis, and lung cancer?

**Unit Results**

**Students will ...**

- 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.
- Describe the structure and function of the lungs and pleural coverings.
- 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 symptoms and causes of emphysema, chronic bronchitis, and lung cancer.

**Suggested Activities**

*The following activities can be incorporated into the daily lessons:*

- 

**Laboratory Experiments**

*The following experiments should be included into the daily lessons.*

- 

---

Garfield High School
Aligned to the 2009 New Jersey Core Curriculum Content Standards
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21\textsuperscript{ST} CENTURY GLOBAL SKILLS
## Unit Overview

**Content Area:** Science  
**Unit Title:** The Digestive System  
**Target Course/Grade Level:** Anatomy and Physiology / Grades 11-12  
**Duration:** 3 weeks or 6-7 blocks  

### Description
This unit concentrates on the functioning of the digestive and excretory systems. While the digestive system is vital for breaking down food into nutrient molecules and absorbing them into the bloodstream, the excretory system is equally important in ridding the body of wastes.

### Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
</table>
| Homeostasis | The digestive system breaks down ingested food into components that can be absorbed into the blood.  
| | Metabolism is the series of reactions that produces ATP which is used to power cellular functions. |

### Learning Targets

**CPI Codes**  
- 5.3.12.A.6

### 21st Century Themes and Skills

**Themes**  
- Global Awareness  
- Health Literacy  

**Skills**  
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

### Guiding Questions

- What are the organs of the alimentary canal and the accessory digestive organs?  
- What is the overall function of the digestive system?  
- What is the general function of each digestive organ?  
- What stimulates and controls of digestive activity?  
- What is the basic function of the mouth, pharynx, and esophagus?  
- Describe the composition of saliva and its functions.  
- What is the structure of a tooth?  
- What is the difference between deciduous and permanent teeth?  
- How do hormones function in the digestive process?  
- What are the end products of protein, fat, and carbohydrate digestion?  
- What is the digestive function of bile?  
- What is a nutrient and kilocalorie?  
- What are the six major nutrient categories?
What are some dietary sources of each of the six nutrient categories?

Why is each type of nutrient important for the cell?

What is the metabolic role of the liver?

Why is energy balance important in the body?

### Unit Results

**Students will ...**

- 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 stimuli and controls of digestive activity.
- Describe the gross and microscopic anatomy and the basic functions of the mouth, pharynx, and esophagus.
- Describe the composition of saliva and its functions.
- Explain the structure of a tooth and differentiate between deciduous and permanent teeth.
- Describe the function of hormones in the digestive process.
- Name the end products of protein, fat, and carbohydrate digestion.
- State the digestive function of bile.
- Define nutrient and kilocalorie.
- List six major nutrient categories. Identify dietary sources of each and why each is necessary for a cell.
- Describe the metabolic role of the liver.
- Explain the importance of energy balance in the body.

### Suggested Activities

**The following activities can be incorporated into the daily lessons:**

- 

### Laboratory Experiments

**The following experiments should be included into the daily lessons.**

- Digestion of Food Particles Lab
## Unit Overview

**Content Area:** Science  
**Unit Title:** The Urinary System  
**Target Course/Grade Level:** Anatomy and Physiology / Grades 11-12  
**Duration:** 2 weeks or 5 blocks

### Description

The urinary system is essential for maintaining homeostasis by regulating water balance, electrolytes, and the pH of the blood, while also ridding the body of nitrogenous wastes.

### Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeostasis</td>
<td>The kidneys filter gallons of fluid every day.</td>
</tr>
<tr>
<td></td>
<td>The kidneys filter wastes that will leave the body in urine and return necessary components to the blood.</td>
</tr>
<tr>
<td></td>
<td>Aside from disposing wastes, the kidneys are also involved in regulating the blood’s volume and chemical makeup.</td>
</tr>
<tr>
<td></td>
<td>The other organs of the urinary system serve as either temporary storage for urine or transport channels for urine.</td>
</tr>
</tbody>
</table>

### Learning Targets

**CPI Codes**

- 5.3.12.A.6

### 21st Century Themes and Skills

**Themes**

- Global Awareness
- Health Literacy

**Skills**

- Critical Thinking and Problem Solving Skills
- Communication and Collaboration Skills
- ICT Literacy
- Life and Career Skills

### Guiding Questions

- What are the regions of the kidney?  
- What is the structure of the kidney and how does that relate to its function?  
- What is the process of the urine formation?  
- What are the areas of the nephron that are responsible for filtrations, reabsorption, and secretion?  
- What is the composition of normal urine?  
- What are abnormal urine components?  
- What is the general structure of the ureters, urinary bladder, and urethra?  
- What is the relationship between the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid-base balance of the blood?
Anatomy & Physiology – The Urinary System

Students will ...

- Identify the regions of the kidneys.
- Identify the structural and functional unit of the kidney.
- Describe the process of urine formation, identifying the areas of the nephron that are responsible for filtration, reabsorption, and secretion.
- Describe the composition of normal urine.
- List abnormal urinary components.
- Describe the general structure and function of the ureters, urinary bladder, and urethra.
- Compare and contrast the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid-base balance of the blood.

Suggested Activities

The following activities can be incorporated into the daily lessons:

- 

Laboratory Experiments

The following experiments should be included into the daily lessons.

- 

### Unit Overview

**Content Area:** Science  
**Unit Title:** The Reproductive System  
**Target Course/Grade Level:** Anatomy and Physiology / Grades 11-12  
**Duration:** 3 weeks or 6-7 blocks

**Description**  
The reproductive system ensures the continuity of the species by producing offspring.

### Concepts & Understandings

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Understandings</th>
</tr>
</thead>
</table>
| • Mitosis  
• Meiosis  
• Cell differentiation | • The reproductive system is not fully active until puberty.  
• There are primary and accessory reproductive organs.  
• Sex hormones play a vital role in the development and function of the reproductive organs.  
• 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 to produce eggs and provide a hospitable environment for a fertilized egg to develop.  
• Both male and female gametes are created during a process called meiosis.  
• During pregnancy there are anatomical as well as physiological changes to the mother's body. |

### Learning Targets

**CPI Codes**
- 5.3.12.A.5  
- 5.3.12.A.6

### 21st Century Themes and Skills

**Themes**
- Global Awareness  
- Health Literacy

**Skills**
- Critical Thinking and Problem Solving Skills  
- Communication and Collaboration Skills  
- ICT Literacy  
- Life and Career Skills

### Guiding Questions
- What are the reproductive system organs in both males and females?  
- What is the composition of semen? What glands produce semen?
What pathway do sperm travel from the testes to the exterior of the body?
What is the structure of sperm and how does it relate to its function?
What is the function of the vesicular follicle and corpus luteum of the ovary?
What are the similarities and differences between spermatogenesis and oogenesis?
What influence do FSH and LH have on testis and ovarian function?
What are the phases and controls of the menstrual cycle?
What is the structure and function of the mammary glands?
What is implantation?
What are the major functions of the placenta?
How is a female's body altered by pregnancy?
What are the three stages of labor?
Why is the presence or absence of testosterone important during embryonic development of the reproductive organs?
What are some common reproductive problems that occur in adult and aging males and females?

### Unit Results

**Students will ...**
- 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 testis 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 testis and ovarian function.
- Describe the phases and controls of the menstrual cycle.
- Describe the structure and function of the mammary glands.
- Describe implantation.
- List the major functions of the placenta.
- Explain several ways that the mother's body is altered by pregnancy.
- 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 in adult and aging males and females.

### Suggested Activities

**The following activities can be incorporated into the daily lessons:**

- 

### Laboratory Experiments

**The following experiments should be included into the daily lessons.**

- 

---

Anatomy & Physiology – The Urinary System
### New Jersey Core Curriculum Content Standards Index

<table>
<thead>
<tr>
<th>Standard</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.12.D.1</td>
<td>5</td>
</tr>
<tr>
<td>5.1.12.D.2</td>
<td>5</td>
</tr>
<tr>
<td>5.1.12.D.3</td>
<td>5</td>
</tr>
<tr>
<td>5.3.12.A.1</td>
<td>7</td>
</tr>
<tr>
<td>5.3.12.A.3</td>
<td>9</td>
</tr>
<tr>
<td>5.3.12.A.4</td>
<td>7</td>
</tr>
<tr>
<td>5.3.12.A.5</td>
<td>28</td>
</tr>
<tr>
<td>5.3.12.A.6</td>
<td>7, 9, 11, 13, 15, 18, 20, 22, 24, 26, 28</td>
</tr>
</tbody>
</table>
Garfield High School
Aligned to the 2009 New Jersey Core Curriculum Content Standards
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Common Core Standards for Literacy in History/Social Studies, Science, and Technical Subjects

The following Common Core Standards are infused throughout the curriculum. Specific standards addressed will be noted in the individual teacher’s lesson plans.

**Reading Standards for Literacy in Science and Technical Subjects (RST)**

**Grades 11-12**

**Key Ideas and Details**

- **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.
- **RST.11-12.2** – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.3** – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

**Craft and Structure**

- **RST.11-12.4** – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- **RST.11-12.5** – Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- **RST.11-12.6** – Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

**Integration of Knowledge and Ideas**

- **RST.11-12.7** – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **RST.11-12.8** – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- **RST.11-12.9** – Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

**Range of Reading and Level of Text Complexity**

- **RST.11-12.10** - By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects (WHST)

Grades 11-12

Text Types and Purpose

- **WHST.11-12.1** - Write arguments focused on discipline-specific content.
  - **WHST.11-12.1a** - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
  - **WHST.11-12.1** - Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
  - **WHST.11-12.1c** - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
  - **WHST.11-12.1d** - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - **WHST.11-12.1e** - Provide a concluding statement or section that follows from or supports the argument presented.

- **WHST.11-12.2** - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
  - **WHST.11-12.2a** - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
  - **WHST.11-12.2b** - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
  - **WHST.11-12.2c** - Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
  - **WHST.11-12.2d** - Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
  - **WHST.11-12.2e** - Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

- **WHST.11-12.3** (See note; not applicable as a separate requirement)
  - NOTE: Students’ narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.
Production and Distribution of Writing

- **WHST.11-12.4** - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **WHST.11-12.5** - 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.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

- **WHST.11-12.7** - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

- **WHST.11-12.10** - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.