Course Title: Anatomy and Physiology

Grade Level(s) 11-12

Course Materials:
Primary Source(s)
Tortora, G.J. and Derrickson, B. Principles of Anatomy and Physiology

Supplemental Source(s)
www.getbodysmart.com
http://library.thinkquest.org/2935/Natures_Best/Nat_Best_High_Level/Page_Shells/Muscular_Shell.html
http://msjensen.cehd.umn.edu/webanatomy/
http://bodybrowser.googlelabs.com/
http://academic.pgcc.edu/~aimholtz/AandP/AandPLinks/ANPlinks.html
http://www.cellsalive.com/

Teacher made resources:
Handouts, Power points, lecture notes, diagrams, quizzes and tests.

Objectives - All students will:

1. Develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and physiology.
2. Recognize the anatomical structures and explain the physiological functions of body systems.
3. Recognize and explain the principle of homeostasis and the use of feedback loops to control physiological systems in the human body.
4. Use anatomical knowledge to predict physiological consequences, and use knowledge of function to predict the features of anatomical structures.
5. Recognize and explain the interrelationships within and between anatomical and physiological systems of the human body.
6. Synthesize ideas to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.
7. Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of each organ system.
8. Interpret graphs of anatomical and physiological data.
Essential Questions:

1. How is the body organized and what does it do to maintain life?
2. What terms are essential to understanding the anatomy of the human body?
3. How are chemical reactions controlled in the human body?
4. What are the basic molecules that make up the human body and how do they work?
5. What role does the cell membrane play in cell communication?
6. How are structure and function related for each of the types of body tissues?
7. What is the purpose of the integumentary system?
8. What are various diseases associated with the integumentary system?
9. What are functions of the skeletal system?
10. How are bones formed and maintained?
11. Why is the muscular system important?
12. How do muscles contract?
13. Why is the nervous system important?
14. How does the CND and the PNS work together?
15. How are reflex arcs different from a regular nerve transmission?
16. Why is the endocrine system important?
17. How does the endocrine system control body functions?
18. Why is blood essential for the maintenance of the body?
19. How does the circulatory system function to cycle blood through the body?
20. How does the heart beat?
21. What factors affect the heart?
22. How does the fetal circulatory system change after birth?
23. How do nonspecific and specific body defenses keep the human body healthy?
24. How does the lymphatic system function in helping the body stay healthy?
25. What is difference between vaccines and antibiotics?
26. How does the respiratory system and circulatory system work together to transport vital gases throughout the body?
27. How does the digestive system provide the body with vital nutrients?
28. How does the urinary system filter blood?
29. What are the functions of the male and female reproductive systems?
30. How do the ovarian and uterine cycles work together to make it possible for reproduction?
<table>
<thead>
<tr>
<th>PA CORE</th>
<th>Content</th>
<th>Performance</th>
<th>Activities/Assessments</th>
</tr>
</thead>
</table>
| 3.1.12.A1. | **Introduction to the Body** | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. | Vocabulary Quiz  
Chapter Test  
Life Size body diagrams with terms labeled  
System poster |
|  | - Structural organization  
- Life functions & needs  
- Maintaining boundaries  
- Movement  
- Responsiveness  
- Digestion  
- Metabolism  
- Excretion  
- Reproduction  
- Growth  
- Nutrients  
- Oxygen  
- Water  
- Body temperature  
- Atmospheric pressure  
- Feedback loops  
- Homeostasis  
- Positive feedback  
- Negative feedback  
- Anatomy terminology  
- Regional terms  
- Directional terms  
- Body planes & Sections  
- Body cavities | | |
| 3.1.12.A5. | **Chemistry & Cells overview** | Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature and their effect on enzyme activity. Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes. Describe the structures of proteins and amino acids. | Word Wall Activity:  
Anatomy, physiology, metabolism, homeostasis, receptor, anatomical position, section, plane  
- Vocabulary Quiz  
- Chapter Test  
Informal:  
- Enzyme lab  
- Cell project  |
|  | - Enzymes  
- Role in chemical reactions  
- Effects of pH and temperature on enzyme activity  
- Organic molecules  
- Carbohydrate, protein, amino acids, nucleic acid (structure and function)  
- Cells, Cell division & Cancer  
- Plant vs. animal cells  
- Mutations—cell cycle—cancer | | |
| 3.1.12.A6. Analyze how cells in different tissues/organisms are specialized to perform specific functions. | Body Tissues
- Epithelial Tissue
  - Structure and function
  - Endocrine vs. exocrine tissue
- Connective tissue
  - Structure and function
- Muscle Tissue
  - Structure and function
- Nervous Tissue
  - Structure and function | Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes. Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. |
| CC.3.6.11-12.C. Produce clear and coherent development, organization, and style are appropriate to task, purpose and audience. | Integument System
- Structure & function
  - Skin
  - Hair
  - Nails
- Skin diseases | Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive & active). Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue. Define the terms endocrine and exocrine. |
<p>| A. BIO.A.1.2.2 Describe relationships between structure and function at various levels of biological organization. | Describe the function of the vertebrate integumentary system. |
| CC.3.5.11-12.G. 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. | | Formal: □ Vocabulary Quiz □ Chapter Test |
| CC.3.5.11-12.I. 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. | | Informal: □ Tissue microscope lab |
| | Word Wall Activity: Epithelial tissue, connective tissue, muscle tissue, nervous tissue, cardiac muscle, striated muscle, smooth muscle |
| | | |</p>
<table>
<thead>
<tr>
<th>B. BIO.A.4.2.1 Explain how organisms maintain homeostasis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skeletal System</strong></td>
</tr>
<tr>
<td>- Anatomy &amp; Function of bone tissue</td>
</tr>
<tr>
<td>- Types and parts of a bone</td>
</tr>
<tr>
<td>- Functions: support, protection, movement, storage</td>
</tr>
<tr>
<td>- Blood cell formation</td>
</tr>
<tr>
<td>- Axial Skeleton</td>
</tr>
<tr>
<td>- Identify major bones</td>
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<tr>
<td>- Appendicular Skeleton</td>
</tr>
<tr>
<td>- Identify major bones</td>
</tr>
<tr>
<td><strong>Muscular System</strong></td>
</tr>
<tr>
<td>- Structure &amp; function</td>
</tr>
<tr>
<td>- 3 types of muscles</td>
</tr>
<tr>
<td>- Muscle anatomy</td>
</tr>
<tr>
<td>- Microscopic make up of a skeletal muscle</td>
</tr>
<tr>
<td>- Physiology of a skeletal muscle</td>
</tr>
<tr>
<td><strong>Muscle Contraction</strong></td>
</tr>
<tr>
<td>- Sliding filament theory</td>
</tr>
<tr>
<td><strong>Muscle Identification</strong></td>
</tr>
<tr>
<td>- Identify major muscles on a model or diagram</td>
</tr>
<tr>
<td><strong>Myoneural Junction</strong></td>
</tr>
<tr>
<td>- Transmission of a signal from a nerve to a muscle</td>
</tr>
<tr>
<td><strong>Describe the anatomy and histology of bone tissue.</strong></td>
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<tr>
<td><strong>Identify the major bones of the axial and appendicular skeleton.</strong></td>
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<tr>
<td><strong>Distinguish between the bones of the axial and appendicular skeleton.</strong></td>
</tr>
</tbody>
</table>

Formal:
- Vocabulary Quiz
- Bone Practical
- Chapter Test

Informal:
- Clay/toothpick skeleton model

Word Wall activity:
- Axial skeleton, appendicular skeleton, osteocytes, ossification, osteoclasts, fracture, hematoma, fontanel, articulation

3.1.12.A1. Relate changes in the environment to various organisms’ ability to compensate using homeostatic mechanisms.

CC.3.5.11-12.G. 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.

CC.3.5.11-12.I. 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.
3.1.12.A1. Relate changes in the environment to various organisms’ ability to compensate using homeostatic mechanisms.

**Nervous System**
- Structure & function
  - Parts of the brain
  - Parts of the spinal cord
- CNS & PNS
  - Divisions of each
  - Types of cells in each
- Nerve impulse transmission
  - Parts of the synapse
  - Transmission of a signal across a synapse
- Reflex arcs
  - Sensory receptor, effector organ, sensory and motor neurons, integration center
- Sympathetic & Parasympathetic divisions
  - Function of each
- Sense organs
  - Relate structure to function for each of the sense organs

**Endocrine**
- Structure & Function
  - Relate the glands to the hormones they secrete
- Hormones
  - Compare endocrine and neural controls

**Blood**
- Composition
  - Plasma and formed elements
- Functions
  - Plasma and formed elements
- Hemostasis
  - Steps of hemostasis
  - Mechanism of coagulation
- Blood types
  - Process
- Transfusion reactions

**Description**
- Identify the major parts of the brain on diagrams or models.
- Identify the major functions of the spinal cord.
- Describe the anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system.
- Identify the general parts of a synapse and describe the physiology of signal transmission across a synapse.
- Identify the parts of a reflex arc
- Identify the major parts of a cross section through a spinal cord.
- Identify the major functions associated with the sympathetic and parasympathetic nervous systems
- Describe the structure of vertebrate sensory organs. Relate structure to functions in vertebrate sensory systems.

**Formal:**
- Vocabulary Quiz
- Chapter Test

**Informal:**
- Senses foldable
- Senses lab
- Neuron models
- Brain dissection
- Eye dissection

**Word Wall activity:**
- CNS, PNS, neuroglia, neuron, synapse, axon, dendrite, reflex, special senses

**CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data,**

**Description**
- Define the terms endocrine and exocrine
- Compare endocrine and neural controls of physiology

**Formal:**
- Vocabulary Quiz
- Chapter Test

**Informal:**
- Endocrine flashcards

**Word Wall activity:**
- Hormone, negative feedback, positive feedback, acromegaly, goiter, diabetes mellitus, insulin, glucagon

**Formal:**
- Vocabulary Quiz
- Chapter Test

**Informal:**
- Synthetic blood typing lab

**Word Wall activity:**
- Formed elements, hematocrit, hemoglobin, anemia, leukocytes,
video, multimedia) in order to address a question or solve a problem.

CC.3.5.11-12.I. 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.

| 3.1.12.A1. Relate changes in the environment to various organisms’ ability to compensate using homeostatic mechanisms. | **Circulatory System**  
- Structure & Function  
  - Anatomy of the heart, blood vessels  
  - Blood flow  
    - Pathway through the heart  
    - Factors that affect blood flow  
  - Pathways of circulation  
    - Systemic circulation  
    - Arterial supply to the brain  
    - Hepatic portal circulation  
    - Fetal circulation  
  - Physiology of circulation  
    - Heart sounds and what they mean  
    - Hypertension and risk factors  

Describe the factors affecting blood flow through the cardiovascular system.  
Describe fetal circulation and changes that occur to the circulatory system at birth.  
Describe the normal heart sounds and what they mean.  
Describe hypertension and some factors that produce it.  

**Formal:**  
- Vocabulary Quiz  
- Chapter Test  

**Informal:**  
- Blood flow foldable  
- Blood flow activity  
- Cardiac output activity  
- Heart dissection  

**Word Wall activity:**  
Myocardium, atria, ventricles, aorta, nodal system, cardiac cycle, cardiac output, artery, vein

| 3.1.12.A1. Relate changes in the environment to various organisms’ ability to compensate using homeostatic mechanisms. | **Lymphatic System & Body Defenses**  
- Nonspecific body defenses  
  - Skin  
  - Mucous membranes  
  - Secretions  
  - Phagocytes  
  - Antimicrobial proteins  
  - Inflammatory response  
  - Specific body defenses  
    - Lymphocytes  
    - Antibodies  
    - Macrophages  
  - Lymphatic structure & function  
  - Vaccines & antibiotics  

Describe the anatomy and physiology of the lymph system.  
Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.  

**Formal:**  
- Vocabulary Quiz  
- Chapter Test  

**Informal:**  
- Specific and non-specific foldables  

**Word Wall activity:**  
Edema, lymph, immunity, pathogen, phagocytes, inflammatory response, diapedesis, pyrogens,
☐ Structure & Function  
☐ Organs of respiratory system  
☐ Respiratory physiology  
☐ Process of ventilation  
☐ Gas exchange  
☐ Gas transport  
☐ Mechanisms that control ventilation | Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation | **Formal:**  
☐ Vocabulary Quiz  
☐ Chapter Test  

**Informal:**  
☐ Exhaling CO2 Lab Report  
☐ Clay models of system  

**Word Wall activity:**  
Pharynx, larynx, bronchi, alveoli, respiration, diaphragm, eupnea, cyanosis, cystic fibrosis |
| 3.1.12.A2. | **Digestive System**  
☐ Structure & Function  
☐ Mechanical & chemical digestion, absorption  
☐ Location of each process  
☐ Describe how each process works to digest food and supply the body with nutrients  
☐ Hormonal/neral control | Describe the physiology of the digestive system, including mechanical digestion, chemical digestion, absorption and neural and hormonal | **Formal:**  
☐ Vocabulary Quiz  
☐ Chapter Test  

**Informal:**  
☐ Digestive System Project  
☐ Clay models of digestive system  

**Word Wall activity:**  
Alimentary canal, mastication, microvilli, peristalsis, deglutition, cellular respiration, metabolism, obesity |
| 3.1.B.A3. | **Reproduction System**  
☐ Structure & Function of Reproductive system  
☐ Pregnancy & Fetal development  
☐ Basic overview | Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.  
Analyze how hereditary and family history can impact personal health  
Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.  
Describe fetal circulation and changes that occur to the circulatory system at birth | **Formal:**  
☐ Vocabulary Quiz  
☐ Chapter Test  

**Informal:**  
☐ Miracle of Life video  

**Word Wall activity:**  
Gonads, gametes, testes, ovaries, semen, scrotum, uterus, oogenesis, spermatogenesis, embryo, fetus |