

## Anatomy and Physiology Honors

### Course Description

In this course, students study the inner workings of the human body, its levels of organization, and the cooperation required between those levels to maintain homeostasis. Students learn precise anatomical and medical terminology and gain experience using a college-level textbook and resources. The knowledge gained through this course provides students with the important concepts and skills needed to pursue a postsecondary education in a related field. In addition to learning foundational knowledge, students practice laboratory skills and participate in a dissection unit where they observe the anatomical structures of a preserved fetal pig, which are closely analogous to the human body. This dissection provides a visual focus for our primary units of study: histology, blood, the cardiovascular system, the skeletal system, the digestive system, and the reproductive system. The Honors Anatomy and Physiology course reinforces skills and dispositions aligned with the **Portrait of the Crusader**, including thinking critically about information presented and solving problems through innovation. Laboratory investigations and in-class activities promote fostering relationships, collaboration, team work, and respect for other student's ideas.

### Essential Questions

- How are anatomy and physiology related and how are they separate as branches of science?
- How does each body system work to maintain homeostasis in the human body?
- How does the body respond when systems leave homeostasis?
- How are organisms structured to ensure efficiency and survival?
- How can scientific knowledge help the medical community?
- How has technology helped to increase our knowledge of anatomy and physiology?
- What language is appropriate for higher education in a medical field related to anatomy and physiology?

### Curriculum Framework

#### Q1, Unit 1 - Language of Anatomy

##### Focus Questions

- How does the medical community communicate precise locations on the body?
- How is the human body organized starting with the cell?
- How do living things maintain homeostasis and necessary life functions?
- What are the consequences of a deficiency of one of the necessary life functions and/or survival needs?

##### Concepts/Skills

- Explain how *standard anatomical position*, *directional terms*, *body planes*, and *cavities* are used to pinpoint precise locations on or in the body.
- Apply anatomical terminology to describe body directions, surfaces, regional landmarks, and body planes.

- Define each component of the structural system: cell, tissue, organ, organ system and explain how they increase in complexity.
- Define the four tissue types and describe how each functions in the body.
- Explain the primary functions of each body system and the major organs of each system.
- Analyze the role of homeostasis and the mechanisms that maintain homeostasis.
- Contrast negative and positive feedback loops.
- Analyze the body's need for nutrients, oxygen, water, body temperature, and atmospheric pressure.
- Justify the need for maintaining boundaries, movement, responsiveness, digestion, metabolism, excretion, reproduction, and growth.

#### Laboratory

- Terminology and Cavity experiment

#### Assessments:

- Written Assessment (unit test) focused on the terminology, concepts and skills learned in the unit.
- Written laboratory report based on the Terminology and Cavity experiment.

### **Q1, Unit 2 - Integumentary System**

#### Focus Questions

- What is the purpose of the integumentary system?
- How is the skin structured to allow for its many functions?
- What types of tissues are in the integumentary system?
- How is homeostasis maintained by the integumentary system?
- What are common diseases and disorders of the integumentary system?

#### Concepts/Skills

- Explain the multiple roles that the integumentary system has in homeostasis: protection, temperature regulation, sensory receptors, biochemical synthesis and absorption.
- Analyze how the skin helps regulate temperature and how humidity impacts thermoregulation.
- Describe the structures and functions of the integumentary system, including accessory structures.
- Explain the difference between the hypodermis, dermis, and epidermis.
- Determine what happens to cells as they move further away from the underlying dermal blood vessels.
- Explain the relationship between UV damage and the three types of cancer.
- Investigate the causes, symptoms, and treatments of specific disorders and/or diseases associated with the integumentary system; organize and present new knowledge to class.

## Project:

- Disease and Disorders Project

## Assessments

- Written assessment focused on terminology, concepts and modeling taught in the unit.
- Powerpoint Presentation on Integumentary System Diseases and Disorders

## **Q2, Unit 3 - Skeletal System**

### Focus Questions

- What are the functions of the skeletal system?
- What are the different bone types and their functions?
- What is the gross anatomy of bones?
- What is the microscopic anatomy of bones? How does this anatomy support function?
- What is the relationship of bones with other systems in the body?
- How do bones help maintain homeostasis?
- What is the structure of joints and how does this relate to their function?

### Concepts/Skills

- Identify the components of the skeletal system: bones, joints, cartilage, ligaments, and tendons.
- Describe the functions of the skeletal system: support, protect, assist movement, facilitate mineral homeostasis, produce blood cells.
- Identify and classify bones as long, flat, short, or irregular and as belonging to the axial or appendicular skeleton; describe their functions.
- Analyze the anatomy of the long bone using accurate terminology.
- Analyze the microscopic anatomy of bone and how form is related to function.
- Describe how bones are nourished and innervated.
- Explain how a bone heals after a break.
- Define and provide examples of bone markings.
- Classify and identify joints based on their structure and function.

### Laboratories

- Bone Identification Lab
- Chicken Wing Dissection Lab
- Bone Fracture Lab

### Assessments

- Written laboratory reports
- Written assessment (unit test) focused on terminology, concepts and modeling taught in the unit.

## **Q2, Unit 4 - Muscular System**

### Focus Questions

- What are the functions of the muscular system?
- How does the muscular system help to maintain homeostasis?
- How do muscles allow for movement? What movements do muscles allow?
- What are the 3 different muscle types and how do they vary?
- How does each muscle type support its specific function?

### Concepts/Skills

- Explain how muscles aid in supporting the body.
- Analyze muscles' role in the homeostasis of the human body.
- Diagram/model how a muscle contraction allows for movement.
- Compare skeletal, cardiac, and smooth muscle structures.
- Analyze the need for different muscle types to support different body structures.
- Illustrate the effects of an action potential in a muscle cell.
- Compare the functions of actin and myosin in muscle function referencing the sliding filament theory.
- Classify the body movements allowed for by skeletal muscle and provide an example of muscle allowing each type of movement.
- Identify the name, location, and movement allowed by all superficial anterior and posterior muscles.
- Classify muscles as prime movers, antagonists, synergists, and fixators

### Laboratories

- Origin and Insertion of Muscle Lab
- Chicken Wing Lab

### Assessments

- Written assessment focused on terminology, concepts and modeling taught in the unit.
- Written lab reports

## **Q3, Unit 5 - Blood, Lymphatic, and Cardiovascular System**

### Focus Questions:

- What role does blood serve in homeostasis within the human body?
- How are blood cells classified?
- What is the path of blood throughout the body?
- What are the structure and functions of the heart?
- What are the types of blood vessels and what are their roles in blood circulation?
- How are blood pressure, pulse, and heart sounds assessed?

### Concepts/Skills

- Trace the flow of blood throughout the body.
- Compare the pulmonary and systemic circuits and explain the need for both.
- Model and label the chambers and valves of a human heart.
- Trace the flow of blood through the heart.
- Compare the structure and function of arteries, veins, and capillaries.
- Analyze their own blood pressure and pulse and compare to averages.
- Identify the various heart sounds and explain their cause.

### Laboratories

- ABO Blood Typing Lab
- Blood Pressure Lab
- Heart Dissection Lab

### Assessments

- Written assessment focused on terminology, concepts and modeling taught in the unit.
- Written lab reports

## **Q3, Unit 6 - Respiratory System**

### Focus Questions

- What are the roles of the various organs and structures of the respiratory system and how have they adapted in these roles?
- The anatomy of organs and structures of the respiratory system are directly related to their physiology. What are the adaptations of the respiratory system that increase surface area and provide protection?
- How does the respiratory system interact with other body systems

### Concepts/Skills

- Identify the organs and structures that compose the respiratory system.
- Describe and relate external respiration, internal respiration, pulmonary ventilation, and respiratory gas transport.
- Explain how changes in volume caused by respiratory muscles, leads to pressure changes relative to atmospheric pressure, which results in air flow into and out of the lungs.
- Measure and distinguish among the various lung capacities.
- Relate lung capacity to fitness and disease. Identify, describe, and compare hiccupping, laughing, crying, coughing, and sneezing.

### Laboratory

- Heart Rate Lab

## Assessments

- Written assessment focused on terminology, concepts and modeling taught in the unit.
- Written lab reports

## **Q4, Unit 7 - Urinary System**

### Focus Questions

- How does the urinary system contribute to maintaining homeostasis in a human body?
- How does the urinary system contribute to the nitrogen cycle?
- The anatomy of organs and structures of the urinary system are directly related to their physiology.
- How does the structure of kidneys allow them to clean the blood?

### Concepts/Skills

- Identify and label the major structures of the kidney.
- Explain how the kidney filters out nitrogen containing waste.
- Explain the kidney's role in water and electrolyte balance of blood.
- Analyze the function of the kidneys in maintaining homeostatic balance.
- Explain the role of the kidney structures in filtering blood.
- Diagram blood flow through the major structures of the kidney.
- Diagram the flow of urine through the major structures of the urinary system.
- Explain the cause and danger of kidney stones.

### Laboratory

- Kidney Dissection Lab

## Assessments

- Written assessments and diagrams focused on structure and function of the kidneys.

## **Q4, Unit 8 - Digestion**

### Focus Questions

- What are the roles of the various organs and structures of the digestive system and how have they adapted in these roles?
- How are the anatomy of organs and structures of the digestive system directly related to their physiology?
- What are the adaptations that have allowed digestive organs and structures to increase surface area?
- How and where are various components of food isolated and absorbed by the body?

## Concepts/Skills

- Identify the organs and structures that compose and are accessory to the alimentary canal.
- Describe the general activities of each digestive system organ.
- Explain the overall function of the digestive system.
- Identify the location of digestion and absorption of foods.
- Explain the enzyme or secretions responsible for specific digestive processes.
- Contrast chemical and mechanical digestion.
- Determine sources of carbohydrates, lipids, and proteins.
- Explain the importance of energy balance in the body and indicate the consequences of energy imbalance.
- Analyze several factors that influence metabolic rate and indicate the effect of each.

## Laboratory

- Fetal Pig Dissection

## Assessments

- Written assessment focused on terminology, concepts and modeling taught in the unit.
- Written lab reports

## Resources

- *Essentials of Human Anatomy & Physiology, 12th Edition*, Marieb and Keller
- Current articles related to topics studied
- Websites accessed during research

## Grading Policy

- Tests: 35 - 50 %
- Quizzes: 15 - 20%
- Labs: 15 - 20 %
- Classwork: 15 - 25 %
- Student Preparation: 15 - 25 %