

## **COURSE INFORMATION**

### **Anatomy & Physiology**

Grade Level:	10 (with recommendation) 11, 12
Length:	1 Year
Period(s) per Day:	1

## **ESSENTIAL UNDERSTANDING**

Anatomy and physiology is a course for students who have passed biology and are interested in working in medical field or interested in how the body works. This course explores the structures and functions of the human body and how one determines the other. Students will also discuss how body uses feedback loops to maintain homeostasis and if homeostasis is disrupted, diseases and disorders are developed.

## **THEMES**

Upon completion of Anatomy and Physiology, the following underlying themes will be discussed and incorporated in the units covered in this class:

1. Homeostasis
  - Organisms will monitor the external and internal environments to keep the body alive by using multiple feedback loops
2. Hierarchy of Structure
  - Each body system is composed of increasingly complex structures working together to accomplish a singular function. Cells work together to form a tissue that organizes into an organ. Organs work together to form an organ system. The collection of organ systems works together to maintain life.
3. Structure and Function
  - The structure of cells, tissues, and organs determines the functions of those structures

## **COURSE STRUCTURE**

Each unit in Anatomy and Physiology will be designed using the following format:

- Engage** - Students discuss and illustrate the major concepts of the body system in the unit
- Explore** - Students actively explore concepts independently and collaboratively in a science lab setting.
- Explain** - Students develop vocabulary, label diagrams, and define major concepts and processes through class and group discussion. Students create written explanation of the concepts learned as well.
- Elaborate** - Students develop a deeper and broader understanding of concepts in lab and in a variety of independent and group activities.
- Evaluate** - Students assess their understanding of the concepts learned during the unit.

### **COURSE OBJECTIVES AND EXPECTATIONS**

#### Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

#### Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system.

#### Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

### **STUDENT OBJECTIVES**

By the end of this course 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. Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of each organ system.

**PACING/TIMELINE AND STANDARDS**

<b>Semester 1</b>	<b>NGSS Content Standards Covered</b>
Unit 1: Introduction to Anatomy <ul style="list-style-type: none"> <li>- Anatomical Vocabulary               <ul style="list-style-type: none"> <li>- Body landmarks</li> <li>- Directional terms</li> <li>- Body systems</li> <li>- Body cavities &amp; planes</li> </ul> </li> <li>- Homeostasis               <ul style="list-style-type: none"> <li>- Necessities to maintain life</li> <li>- Survival Needs</li> <li>- Negative &amp; positive feedback loops</li> </ul> </li> </ul>	HS-LS1-2 HS-LS1-3
Unit 2: Biochemistry & Body Tissues <ul style="list-style-type: none"> <li>- Components of a cell</li> <li>- Buffers</li> <li>- Cellular respiration</li> <li>- Body tissues               <ul style="list-style-type: none"> <li>- Structure &amp; function of epithelial tissue</li> <li>- Structure &amp; function of connective tissue</li> <li>- Structure &amp; function of muscular tissue</li> <li>- Structure &amp; function of nervous tissue</li> </ul> </li> </ul>	HS-LS1-2 HS-LS1-3 HS-LS1-7
Unit 3: Integumentary System <ul style="list-style-type: none"> <li>- Types of body membranes</li> <li>- Anatomy of skin</li> <li>- Appendages of skin (hair, nails, etc.)</li> </ul>	HS-LS1-2 HS-LS1-3

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**Semester 1****NGSS Content Standards Covered**

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- Homeostatic imbalances of skin
- Types of sunburns
- Types of skin cancers
  - ABCDE rule for skin cancers
- Rule of 9's (fluid loss due to severe burns)

**Unit 4: Skeletal System**

HS-LS1-2

HS-LS1-3

- Types of bones
- Classification of bones
- Microscopic anatomy of bones
- Anatomy of the axial skeleton
- Anatomy of the appendicular skeleton
- Physiology of the skeletal system
- Anatomy of joints
- Homeostatic imbalances of the skeletal system

**Unit 5: Muscular System**

HS-LS1-2

HS-LS1-3

HS-LS1-7

- Microscopic anatomy of skeletal muscle
- Physiology of skeletal muscle contractions
- Energy for muscle contractions
- Types of muscle contractions
- Names of superficial muscles of head, neck, arms, torso, and legs

**Unit 6: Nervous System**

HS-LS1-2

HS-LS1-3

- Divisions of the nervous system
- Structural & functional classification of the nervous system
- Structural & functional classification of a neuron
- Anatomy of a neuron
- Physiology of a nerve impulse
- Physiology of reflexes
- Components of a brain
  - Structure & function of cerebral

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**Semester 1****NGSS Content Standards Covered**

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- hemispheres
- Structure & function of diencephalon
- Structure & function of brainstem
- Structure & function of cerebellum
- Brain dissection
- Brain dysfunctions
- Anatomy of Peripheral Nervous System
  - Structures of spinal cord
  - Structures of spinal nerves
- Physiology of autonomic nervous system

**Semester 2****NGSS Content Standards Covered**

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## Unit 7: Special Senses

- External anatomy of eye
- Internal anatomy of eye
- Physiology of vision
- Anatomy of ear
- Physiology of hearing & balance
- Anatomy of nasal cavity
- Physiology of smell
- Anatomy of taste buds
- Physiology of taste
- Homeostatic imbalances of eyes & ears

HS-LS1-2

HS-LS1-3

## Unit 8: Endocrine System

- Physiology of hormones
- Anatomy of endocrine system
  - Major organs of endocrine system
  - Hormones released by each organ
- Homeostatic imbalances of endocrine system

HS-LS1-2

HS-LS1-3

## Unit 9: Blood &amp; Cardiovascular System

HS-LS1-2

HS-LS1-3

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**Semester 1****NGSS Content Standards Covered**

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- Anatomy of blood cells (red & white)
- Composition of blood
- Types of white blood cells
- Homeostatic imbalances of blood
- Anatomy of heart
- Physiology of heart beat
- How to read electrocardiogram and use blood pressure machine
- Anatomy of arteries & veins
- Heart dissection
- Homeostatic imbalances of cardiovascular system

Unit 10:	Lymphatic & Immune System	HS-LS1-2 HS-LS1-3
	<ul style="list-style-type: none"><li>- Structure &amp; function of lymphatic system</li><li>- Physiology of cell mediated immune response<ul style="list-style-type: none"><li>- B cells &amp; T cells</li></ul></li><li>- Physiology of humoral mediated immune response</li><li>- Anatomy of antibodies</li><li>- Homeostatic imbalances of lymphatic &amp; immune systems</li></ul>	

Unit 11:	Respiratory System	HS-LS1-2 HS-LS1-3
	<ul style="list-style-type: none"><li>- Anatomy of the respiratory system</li><li>- Physiology of breathing</li><li>- Mechanics of breathing</li><li>- Homeostatic imbalances of the respiratory system</li></ul>	

Unit 12:	Digestive System	HS-LS1-2 HS-LS1-3 HS-LS1-7
	<ul style="list-style-type: none"><li>- Anatomy of digestive system</li><li>- Physiology of digestion</li><li>- Accessory organs of digestive system</li></ul>	

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**Semester 1****NGSS Content Standards Covered**

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- Homeostatic imbalances of digestive system

Unit 13:	Urinary System	HS-LS1-2 HS-LS1-3
	<ul style="list-style-type: none"><li>- Anatomy of urinary system</li><li>- Structure &amp; function of kidneys</li><li>- Physiology of urination</li><li>- Kidney dissection</li><li>- Homeostatic imbalances of urinary system</li></ul>	

Unit 14:	Reproductive System	HS-LS1-2 HS-LS1-3 HS-LS3-2
	<ul style="list-style-type: none"><li>- Anatomy of male reproductive system<ul style="list-style-type: none"><li>- Functions of male reproductive system (spermatogenesis)</li></ul></li><li>- Anatomy of female reproductive system<ul style="list-style-type: none"><li>- Functions of female reproductive system (oogenesis)</li></ul></li><li>- Fertilization &amp; fetal development</li><li>- Homeostatic imbalances of reproductive system</li></ul>	

**TIMELINE****Semester 1**

Unit 1:	Introduction to Anatomy	1 weeks to cover
Unit 2:	Biochemistry & Body Tissues	2 weeks to cover
Unit 3:	Integumentary System	2 weeks to cover

Unit 1:	Introduction to Anatomy	1 weeks to cover
Unit 4:	Skeletal System	4 weeks to cover
Unit 5:	Muscular System	4 weeks to cover
Unit 6:	Nervous System	4 weeks to cover

## **Semester 2**

Unit 7:	Special Senses	2 weeks to cover
Unit 8:	Endocrine System	2 weeks to cover
Unit 9:	Blood & Cardiovascular System	3 weeks to cover
Unit 10:	Lymphatic System	2 weeks to cover
Unit 11:	Respiratory System	2 weeks to cover
Unit 12:	Digestive System	2 weeks to cover
Unit 13:	Urinary System	2 weeks to cover
Unit 14:	Reproductive System	2 weeks to cover

## **CONTENT STANDARDS**

- HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
- HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- HS-LS1-7 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-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors

## **DISCIPLINARY CORE IDEAS**

### **LS1.A Structure and Function**

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Systems of specialized cells within organisms help them perform the essential functions of life.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

### **LS1.B Variation of Traits**

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.

### **LS1.D Information Processing**

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

## **RESOURCES**

Next Generation Science Standards, Disciplinary Core Ideas, and Crosscutting Concepts:  
[https://www.nextgenscience.org/search-standards?keys=&tid%5B%5D=107&tid\\_3%5B%5D=96](https://www.nextgenscience.org/search-standards?keys=&tid%5B%5D=107&tid_3%5B%5D=96)

Panola College Course Syllabus

<https://www.panola.edu/syllabi/documents/biol2401.pdf>

Human Anatomy & Physiology Society: Learning Goals for Students.

[https://www.hapsweb.org/page/AP\\_LearningGoals](https://www.hapsweb.org/page/AP_LearningGoals)