Human Anatomy and Physiology

Little Chute
Science
Grades 11 - 12, 1 Credit

Course Overview

Human Anatomy and Physiology presents the structure and function of the human body, designed particularly for students interested in a career in the health or medical field. Emphasis on specific body organ systems is explored through a variety of hands-on dissections, including a semester-long dissection of the fetal pig. Furthermore, enrolled students will have the opportunity to work with real human cadavers at St. Norbert College. Student assessment is based on exams, projects, debates, current event presentations, group presentations, labs, web quests, dissections, a fetal pig photo journal, a research paper, and a life-size paper human paper model.

Scope and Sequence

Timeframe	Unit	Instructional Topics
7 Day(s)	Unit 1- An Orientation to the Human Body	1.1: Overview of Anatomy and Physiology 1.2: Homeostasis 1.3: Maintaining Life 1.4: Levels of Structural Organization 1.5: Language of Anatomy and Physiology
10 Day(s)	Unit 2- Cells	2.1: Cellular Anatomy 2.2: Cellular Physiology 2.3: Cell Types
13 Day(s)	Unit 3- Biochemistry and Histology	3.1: Biochemistry 3.2: Histology
10 Day(s)	Unit 4- Integumentary and Urinary Systems	4.1: Integumentary System 4.2: Urinary System
14 Day(s)	Unit 5- Skeletal & Muscular System	5.1: Bone Anatomy 5.2: Axial Skeleton 5.3: Appendicular Skeleton 5.4: Cartilage, Ligaments, and Joints 5.5: Developmental Aspects of the Skeleton 5.6: Muscle Tissue and Types 5.7: Gross Anatomy of Skeletal Muscles 5.8: Body Movements and Naming Skeletal Muscles 5.9: Muscular Contraction 5.10: Major Muscles
8 Day(s)	Unit 6- Nervous System and Special Senses	6.1: Organization, Structure & Function of Nervous

		System 6.2: Central Nervous System (CNS) 6.3: Peripheral Nervous System (PNS) 6.4: The Eyes (Vision) 6.5: The Ear (Hearing and Balance) 6.6: The Tongue and Nose (Taste, Flavor, & Smell)
9 Day(s)	Unit 7- Blood and the Cardiovascular System	7.1: Blood: Composition and Functions 7.2: Blood: Hematopoiesis and Hemostasis 7.3: Blood: Groups, Blood-Typing & Transfusions 7.4: The Heart 7.5: Blood Vessels
6 Day(s)	Unit 8- Endocrine and Lymphatic Systems	8.1: Endocrine System: Overview and Hormone Function 8.2: Major Organs and Hormones 8.3: Lymphatic System: Overview 8.4: Lymphatic System: Specific Defenses 8.5: Lymphatic System: Nonspecific Defenses
9 Day(s)	Unit 9- Digestive and Respiratory Systems	9.1: Digestive System: Anatomy 9.2: Digestive System: Physiology 9.3: Respiratory System: Anatomy 9.4: Respiratory System: Physiology
6 Day(s)	Unit 10- Reproductive System	10.1: Male Reproductive System 10.2: Female Reproductive System 10.3: Reproduction, Pregnancy, and Embryonic Development
Ongoing	Unit 11- Developmental Aspects of Anatomy and Physiology	
Ongoing	Unit 12- Human Health	12.1: Human Health
Ongoing	Unit 13- Etymology of Anatomy and Physiology Terms	
Ongoing	Unit 14- Literacy in Anatomy and Physiology	14.1: Thinking Maps, Comprehension Maps, and Vocab Tools
Ongoing	Unit 15- Writing in Anatomy and Physiology	15.1: Reviews, Paragraphs, Reports, & Reflections

Ongoing	Unit 16- Problem Solving & Critical Thinking	16.1: Problem Solving and Critical Thinking
Ongoing	Unit 17- Technology Education	17.1: Using Computers and Software 17.2: Using Microscopes and Other Science Technology

Academic Vocabulary

Reference Academic Vocabulary General List and the Vocabulary English/Spanish with definitions

Prerequisites

Algebra I
Chemistry

Course Details

UNIT: An Orientation to the Human Body -- 7 Day(s)

Description
This unit provides the student with a general overview of the entire human body. It introduces the terms "anatomy" and "physiology" and describes how the two are interrelated, as well as why the two are taught concurrently rather than separately. This unit also introduces the student to the levels of structural organization in the human body, as well as, concepts such as homeostasis and directional terminology.

This unit contains a plethora of new vocabulary which will be used throughout the remainder of the course.

TOPIC: An Overview of Anatomy and Physiology -- 1 Day(s)

Learning Targets

Define anatomy and physiology. Explain how they are related.

TOPIC: Homeostasis -- 1 Day(s)

Learning Targets

Define homeostasis and explain its importance.

Define negative feedback and describe its role in maintaining homeostasis and normal body function.

TOPIC: Maintaining Life -- 1 Day(s)

Learning Targets

List functions that humans must perform to maintain life.

Verbally describe the anatomical position or demonstrate it.

TOPIC: Levels of Structural Organization -- 1 Day(s)

Learning Targets

Classify by organ system all organs discussed.

Identify the organs discussed on a diagram or dissectible torso.

Name the levels of structural organization that make up the human body and explain how they are related.

Name the organ systems of the body and briefly state the major functions of each system.

TOPIC: The Language of Anatomy and Physiology -- 3 Day(s)

Learning Targets

Locate the major body cavities and list the chief organs in each cavity.

Use proper anatomical terminology to describe body directions, surfaces, and body planes.

Verbally describe the anatomical position or demonstrate it.

UNIT: Cells -- 10 Day(s)

Description
This unit will provide a quick recap of cell anatomy and physiology, as learned in the prerequisite Biology class, while delving into greater detail than previously learned. A discussion of the seven basic cell types that exist in the body will also be discussed.

TOPIC: Cellular Anatomy -- 5 Day(s)

Learning Targets

Define cell and identify the three main regions of any cell: nucleus, plasma membrane, and cytoplasm.

TOPIC: Cellular Physiology -- 4 Day(s)

Learning Targets

Identify the major organelles of a cell; describe the structure and function of each and explain their prominence and significance among varying cells throughout the body

TOPIC: Cell Types -- 1 Day(s)

Learning Targets

Name some cell types and relate their overall shape and internal structure to their special functions

UNIT: Biochemistry and Histology -- 13 Day(s)

Description
In this unit, students will learn the biochemical basis of life, describing major aspects of carbohydrates, proteins, lipids and nucleic acids. Furthermore, continuity will be established by linking cytology and histology concepts, describing the structure and function of different tissues throughout the body.

TOPIC: Biochemistry -- 6 Day(s)

Learning Targets

Distinguish between organic and inorganic compounds.

Explain the basic structure and function of carbohydrates, as well as, identify their homeostatic contributions in the body.

Explain the basic structure and function of lipids, as well as, identify their homeostatic contributions in the body.

Explain the basic structure and function of nucleic acids, recognizing their role in protein synthesis, DNA replication and heredity.

Explain the basic structure and function of proteins, as well as, identify their homeostatic contributions in the body.

Identify basic functional units, polymers, common names, and specific examples of carbohydrates, proteins, lipids, and

nucleic acids.
Name the four major organic compounds of the human body and identify the relative abundance of each.

TOPIC: Histology -- 7 Day(s)

Description
Students will learn how similar cells come together to create tissues within the human body. They will also learn the structure and function of body tissues, as well as, processes of tissue repair.

Learning Targets

Describe the process of tissue repair, distinguishing between fibrosis and regeneration.

Explain how the four tissue types differ structurally and functionally.

Give the chief locations of the various tissue types in the body.

UNIT: Integumentary and Urinary Systems -- 10 Day(s)

Description
Students will explore the structure and function of body membranes, skin, as well as, the organs of the urinary system. Similarities and differences between each system will be discussed.

TOPIC: Integumentary System -- 5 Day(s)

Learning Targets

Compare the structure (tissue makeup) of the major membrane types.

Describe the distribution and function of the epidermal derivatives - sebaceous glands, sweat glands and hair.

Differentiate between first, second and third degree burns and explain the importance of the "rule of nines."

List several important functions of the integumentary system and explain how these functions are accomplished.

List the general functions of each membrane type--cutaneous, mucous, serous, and synovial--and give its location in the body.
Name the factors that determine skin color and describe the function of melanin.

Name the layers of the epidermis and dermis and describe the characteristics of each.

TOPIC: Skeletal System: Cartilage, Ligaments and Joints -- 1 Day(s)

Learning Targets

Compare and contrast the course and length of the male urethra to that of a female.

Describe common urinary problems, including: anuria, polyuria, oliguria and urinary tract infections.

Describe micturition and identify the difference in control of the external and internal urethral sphincters.

Describe the composition of urine.

Describe the function of the kidneys in excretion of nitrogen-containing wastes.

Describe the general structure and function of the ureters, urinary bladder and urethra.

Describe the location of the kidneys, ureters, urinary bladder, urethra, and adrenal glands.

Describe the process of urine formation, identifying the areas of the nephron that are responsible for filtration, reabsorption and secretion.
Identify the following regions of a kidney (longitudinal section): hilus, cortex, medulla, medullary pyramids, calyces, pelvis, and renal columns.
Recognize that the nephron is the structural and functional unit of the kidney, and describe its anatomy.

UNIT: Skeletal and Muscular Systems -- 14 Day(s)

Description
This unit focuses on the structure and function of the skeletal and muscular systems. Gross and microscopic anatomy of each will be discussed.

TOPIC: Skeletal System: Bone Anatomy -- 2 Day(s)

Learning Targets

Describe the differences in structure and function of compact bone and spongy bone.

Describe the process of bone formation in the fetus and summarize the events of bone remodeling throughout life.

Explain the role of bone salts and the organic matrix in making bone both hard and flexible.

Identify the major anatomical areas of a long bone (diaphysis, periosteum, epiphysis, articular cartilage, epiphyseal line, epiphyseal plate, yellow marrow, red marrow.)
Identify the subdivisions of the skeleton as axial or appendicular.

List and describe five functions of the skeletal system.

Name and describe four main kinds of bones.

Name and describe various types of fractures.

TOPIC: Skeletal System: Axial Skeleton -- 1 Day(s)

Learning Targets

Describe how the skull of a newborn infant differs from that of an adult. Explain the function of fontanels.

Discuss the importance of the intervertebral discs and spinal curvatures.

Explain how the abnormal spinal curvatures differ from one another.

Identify the bones of the skull.

Name the parts of a typical vertebra and explain in general how the cervical, thoracic and lumbar vertebrae differ from one another.

TOPIC: Skeletal System: Appendicular Skeleton -- 1 Day(s)

Learning Targets

Describe important differences between male and female pelvis.

Identify on a skeleton the major bones of the appendicular skeleton.

TOPIC: Skeletal System: Cartilage, Ligaments and Joints -- 1 Day(s)

Learning Targets

Define ligament and distinguish from a tendon.
Describe the three types of cartilage in the human body and identify their locations in the human body.
Name three major categories of joints and compare the amount of movement allowed by each.

TOPIC: Skeletal System: Developmental Aspects of the Skeleton -- 1 Day(s)

Learning Targets

Identify some of the causes of bone and joint problems throughout life.

TOPIC: Muscular System: Muscle Tissue and Types -- 1 Day(s)

Learning Targets

Define and explain the role of the following: endomysium, perimysium, epimysium, tendon and aponeurosis.
Describe the similarities and differences in the three types of muscle tissue and where they are found in the body.
Describe the structure of skeletal muscle from the gross to microscopic level.

TOPIC: Muscular System: Gross Anatomy of Skeletal Muscles -- 3 Day(s)

Learning Targets

Name and locate the major muscles of the human body on a diagram and state the action of each.

TOPIC: Muscular System: Body Movements and Naming Skeletal Muscles -- 1 Day(s)

Learning Targets

Define origin and insertion.
Demonstrate or identify the different types of body movements.
List some criteria used in naming muscles.

TOPIC: Muscular System: Muscular Contraction -- 1 Day(s)

Learning Targets

Describe how an action potential is initiated in a muscle cell.
Describe the effects of aerobic and resistance exercise on skeletal muscles and other body organs.
Describe the events of muscle contraction.

TOPIC: Muscular System: Major Muscles -- 2 Day(s)

Learning Targets

Name the major muscles of the human body.

UNIT: Nervous System and Special Senses -- 8 Day(s)

Description

In this unit students will explore the structure and function of the nervous system, including a detailed study of the brain and the eye.

TOPIC: Nervous System: Organization, Structure and Function of the Nervous System -- 1 Day(s)

Learning Targets

Describe the structure and function of a neuron and describe how its organization relates to white and grey matter.

Explain the structural and functional classifications of the nervous system and define central nervous system and peripheral nervous system and list the major parts of each.

List the general functions of the nervous system.

TOPIC: Nervous System: Central Nervous System (CNS) -- 2 Day(s)

Learning Targets

Describe the structure of the spinal cord and list two important functions of the spinal cord.

Discuss the formation and function of the cerebrospinal fluid and the blood-brain barrier.

Identify and indicate the functions of the major regions of the cerebral hemispheres, diencephalon, brain stem and cerebellum on a human brain model or diagram.

Name the three meningeal layers and state their functions.

TOPIC: Nervous System: Peripheral Nervous System (PNS) -- 1 Day(s)

Learning Targets

Compare and contrast autonomic and somatic responses of the nervous system.

Describe the two major divisions of the peripheral nervous system and name the three types of neurons that contribute to these divisions.

Identify the number of major nerves that branch off of the spinal cord to distribute impulses throughout the body.

TOPIC: Special Senses: The Eye (Vision) -- 2 Day(s)

Learning Targets

Describe image formation on the retina.

Explain the difference in rod and cone function.

When provided with a model or diagram, identify the accessory structures of the eye and list the functions of each.

TOPIC: Special Senses: The Ear (Hearing and Balance) -- 1 Day(s)

Learning Targets

Describe how the equilibrium organs help maintain balance.

Explain how one is able to localize the source of a sound.

Identify the structures of the external, middle and internal ear and list the functions of each.

TOPIC: Special Senses: The Tongue and Nose (Taste, Flavor and Smell) -- 1 Day(s)

Learning Targets

Compare and contrast flavor and taste.

Describe how the olfactory receptors and olfactory bulbs contribute to the sense of smell, as well as flavor.

Identify the four types of oral papillae and describe the function of each.

UNIT: Blood and the Cardiovascular System -- 9 Day(s)

Description

Students will explore the various types of blood cells and other blood components. They will explain the formation of blood and compare and contrast blood types. They will share how blood is transported throughout the body via the heart and blood vessels.

TOPIC: Blood: Composition and Functions -- 1 Day(s)

Learning Targets

Describe the composition and volume of whole blood.

Describe the composition of plasma and discuss its importance in the body.

List factors that affect blood pressure.

TOPIC: Blood: Hematopoiesis and Hemastasis -- 1 Day(s)

Learning Targets

Describe the blood clotting process.

Describe the formation of blood, identifying the organs that participate in the process.

TOPIC: Blood: Groups, Blood-Typing and Transfusions -- 2 Day(s)

Learning Targets

Describe ABO and Rh blood groups.

Explain the basis for a transfusion reaction.

TOPIC: Cardiovascular System: The Heart -- 3 Day(s)

Learning Targets

Define systole, diastole, stroke volume and cardiac cycle.

Describe the location of the heart in the body and identify its major anatomical areas on a model or a diagram.

Explain the operation of the heart valves. Define heart sounds and murmur.

Trace the pathway of blood through the heart and lungs.

TOPIC: Cardiovascular System: Blood Vessels -- 2 Day(s)

Learning Targets

Compare and contrast the structure and function of arteries, veins and capillaries.

Define blood pressure and pulse and name several pulse points.

Define hypertension and atherosclerosis and describe possible health consequences of each.

Identify the body's major arteries and veins and name the body region supplied by each.

List factors that affect blood pressure.

UNIT: Endocrine and Lymphatic Systems -- 6 Day(s)

Description

This unit explores the endocrine and lymphatic systems. Through their exploration of the endocrine system, students will be able to identify major endocrine organs and hormones in the body. The role of the lymphatic system includes how the human body reacts to pathogens. Topics include nonspecific defenses, specific defenses and the development of the immune system.

TOPIC: Endocrine System: Overview and Hormone Function -- 1 Day(s)

Learning Targets

Define hormone and target organ.

Define negative feedback and describe its role in regulating blood levels.

Describe how hormones bring about their effects on the body.

Describe the difference between endocrine and exocrine glands.

TOPIC: Endocrine System: Major Organs and Hormones -- 2 Day(s)

Learning Targets

Explain how various endocrine glands are stimulated to release their hormonal products.

Identify major endocrine glands and tissues on a diagram.

Name several antimicrobial substances produced by the body that act in a nonspecific body defense.

TOPIC: Lymphatic System: Overview -- 1 Day(s)

Learning Targets

Describe how lymph is transported and define the functions of the lymph nodes, tonsils, thymus, Peyer's patches and the spleen.

Explain how the lymphatic system is related to the immune system and the cardiovascular system.

TOPIC: Lymphatic System: Specific Defenses -- 1 Day(s)

Learning Targets

Compare and contrast the development of B and T cells and describe their roles in immunity.

Define antigen.

Describe immunodeficiencies, allergies and autoimmune disease.

Describe several ways in which antibodies act against antigens.

Distinguish between active and passive immunity.

Explain the importance of the interactions between macrophages and lymphocytes.

List the five classes of antibodies and describe their specific roles in immunity.

Name the two arms of the immune response and relate each to a specific lymphocyte type.

TOPIC: Lymphatic System: Nonspecific Defenses -- 1 Day(s)

Learning Targets

Describe the inflammatory process.

Describe the protective functions of the skin and mucous membranes.

Explain the importance of phagocytes and natural killer cells.

Name several antimicrobial substances produced by the body that act in a nonspecific body defense.

UNIT: Digestive and Respiratory Systems -- 9 Day(s)

Description

In this unit students will have the opportunity to explore the structure and function of the digestive and respiratory systems.

TOPIC: Digestive System: Anatomy -- 3 Day(s)

Learning Targets

Describe the composition and function of saliva.

Explain how villi aid digestive processes in the small intestine.

Identify the overall function of the digestive system and the general functions of the organs.

Name the organs of the alimentary canal and accessory digestive organs. Identify each on a diagram or model.

TOPIC: Digestive System: Physiology -- 2 Day(s)

Learning Targets

Describe how food is mixed and moved along the digestive tract.

Describe the functions of hormones and enzymes in digestion.

Describe the mechanisms of swallowing, vomiting and defecation.

Name several factors that influence respiratory rate.

TOPIC: Respiratory System: Anatomy -- 2 Day(s)

Learning Targets

Describe the structure and function of the lungs and pleural coverings.

Name the organs forming the respiratory passageway from the nasal cavity to the alveoli and describe the functions of each.

TOPIC: Respiratory System: Physiology -- 2 Day(s)

Learning Targets

Define the following terms: tidal volume, vital capacity, expiratory reserve volume, inspiratory reserve volume and residual air.
Define: cellular respiration, external respiration, internal respiration, pulmonary ventilation, expiration and inspiration.

Describe how oxygen and carbon dioxide are carried in the blood.

Describe the process of gas exchange in the lungs and tissues.

Explain how the respiratory muscles cause volume changes that lead to air flow into and out of the lungs.

Name several factors that influence respiratory rate.

UNIT: Reproductive System -- 6 Day(s)

Description
This unit explores the basic anatomy and physiology of the reproductive system, discussing important differences between males and females.

TOPIC: Anatomy and Physiology of the Male Reproductive System -- 2 Day(s)

Learning Targets

Define erection, ejaculation and circumcision.

Identify the major structures and functions of the male reproductive system.

Name the endocrine and exocrine products of the testes and discuss the composition of semen, naming the glands that produce it and tracing the pathway that sperm takes after it's created.

TOPIC: Anatomy and Physiology of the Female Reproductive System -- 3 Day(s)

Learning Targets

Define and describe endometrium, myometrium, ovulation and menstruation.

Identify the main structures and functions of the female reproductive system.

TOPIC: Reproduction, Pregnancy and Embryonic Development -- 1 Day(s)

Learning Targets

Define and/or describe fertilization, zygote, implantation, embryo and fetus.

Indicate several ways that pregnancy alters or modifies the functioning of the mother's body and describe how labor is initiated. Students will also briefly discuss the three stages of labor.

List the major functions of the placenta.

UNIT: Developmental Aspects of Anatomy and Physiology -- Ongoing

Description
This is an ongoing unit that describes developmental changes that occur throughout the lifespan of the human body. Differences in age, gender, and race will be discussed.

UNIT: Human Health -- Ongoing

Description
This is an ongoing unit. With each body system, students will explore diseases and human health issues association with the functioning of that system.

TOPIC: Human Health [Ongoing]

Learning Targets

Students will explore various topics that relate human anatomy and physiolgy to human health.

UNIT: Etymology of Anatomy and Physiology Terms -- Ongoing

Description
This is an ongoing unit which addresses the origins of vocabulary terms discussed in class, including derivation, compounding, onomatopoeia and sound symbolism.

UNIT: Literacy in Anatomy and Physiology -- Ongoing

Description
This is an ongoing unit. Students will be encouraged to think critically and reflect on their learning by participating in best teaching practices.

TOPIC: Students will use thinking maps, comprehension maps, and vocabulary tools to aid in questioning, sythesizing and reflecting processes. -- 0 Day(s)

Learning Targets

UNIT: Writing in Anatomy and Physiology -- Ongoing

Description
This is an ongoing unit. Students will practice writing in various assignments including current event reviews, informational paragraphs, lab reports and reflective paragraphs.

TOPIC: Reviews, Paragraphs, Reports and Reflections [Ongoing]

Learning Targets

Students will write current event reviews.

Students will write informational paragraphs.

Students will write lab reports.

Students will write persuasive paragraphs.

Students will write reflective paragraphs.

UNIT: Problem Solving and Critical Thinking in Anatomy and Physiology -- Ongoing

Description
Students will complete a variety of problem solving and critical thinking projects. Some will be required of all students, while others will involve project choice. Examples of problem solving skills are induction, deduction, error analysis, analyzing perspectives, constructing support, comparing, contrasting, classifying and experimental inquiry. This is an ongoing unit.

TOPIC: Using Microscopes and Other Science Technology [Ongoing]

Learning Targets

Students will practice applying knowledge to problems in human anatomy and physiology.

UNIT: Technology Education in Anatomy and Physiology -- Ongoing

Description
This is an ongoing unit. Students will use computer and science technology throughout the course.

TOPIC: Using Computers and Software [Ongoing]

Learning Targets

Students will use Excel to create flow charts showing various physiological processes.

Students will use interactive anatomy and physiology websites and online flashcard websites to reinforce material.

Students will use software programs such as ADAM to reinforce anatomy and physiology concepts.

TOPIC: Using Microscopes and Other Science Technology [Ongoing]

Learning Targets

Students will use compound light microscopes to examine tissue slides and save them as digital images on a computer.