

Human Biology

Course Syllabus

Course Description

Human Biology increases student understanding of the structures and functions of the human body systems. Students will relate biological concepts based on cells, tissues, and organs to real-world applications.

Learning Outcomes

Upon successful completion of this course, students will be able to:

- Identify the structures and define the functions of the human body systems.
- List cell organelles and their biological functions.
- Demonstrate an understanding of genetics and inherited traits.
- Summarize principles of evolution and ecology as well as human impact on the biosphere. the steps, in order, of the immune response to infection.

Course Outline and Objectives

Chapter 1: Learning about Human Biology

1. List five basic characteristics of life.
2. Describe the eleven levels into which nature has been organized.
3. Identify the five steps used in the scientific method.
4. List the strengths and limits of scientific study.
5. Explain the importance of homeostasis.
6. Identify three causes of emerging diseases.

Chapter 2: Chemistry of Life

1. Explain how chemical bonds join atoms to form molecules.
2. Describe the three types of chemical bonds that occur in biological molecules.
3. Describe the chemical properties of water that help support life.
4. Outline the role of acids, bases, salts, and buffers in the body.
5. Describe the seven biological roles of proteins.
6. List the composition and functions of three nucleotides.

Chapter 3: Cells and How They Work

1. Differentiate between a prokaryotic cell and a eukaryotic cell.
2. Discuss the functions of organelles of a eukaryotic cell.
3. Define the structure and functions of the organelles that make up the endomembrane system.
4. Identify the cause and the effects of mitochondrial disorders.
5. Describe the causes, symptoms, and the treatment for cholera.
6. List the three steps involved in the process of cellular respiration.
7. Explain how fats and proteins provide energy to cells.

Chapter 4: Tissues, Organs, and Organ Systems

1. Describe the structure, location, and functions of the three types of fibrous connective tissue.
2. Describe the structure, location, and functions of the four types of special connective tissue.
3. Describe the structure, location, and functions of the three types of muscle tissue.
4. Describe the two components of the nervous tissue.
5. Diagram the four major body cavities and the organs they contain.
6. List the seven functions of the skin.
7. Identify the locations and functions of sweat glands, oil glands, and hair.
8. Explain how sensory receptors, integrators, and effectors interact to maintain homeostasis.
9. Compare and contrast changes in the body that occur due to extreme cold versus heat exhaustion.

Chapter 5: The Skeletal System

1. Explain the development of bones based on the cartilage model.
2. Discuss two important functions of bone remodeling.
3. Differentiate between ligaments and tendons.
4. Summarize the four bones of the axial skeleton.
5. Explain how the intervertebral disks function in the vertebral column.
6. Identify the bones of the appendicular skeleton.
7. Describe the three main types of joints in the skeletal system.
8. Describe two skeletal disorders.

Chapter 6: The Muscular System

1. Differentiate between the two basic types of skeletal muscles.
2. Explain the sliding filament mechanism.
3. Describe the role of neuromuscular junctions in the transmission of nerve impulses.
4. Summarize how a motor unit, length, and tension determine the characteristics of a muscle contraction.
5. Explain how bacterial infections affect nervous system signals to muscles.
6. Outline the occurrence, causes, symptoms, and treatment of cancer in muscle tissue.

Chapter 7: Circulation – The Heart and Blood Vessels

1. Describe how the lymphatic system is linked to the cardiovascular system.
2. Illustrate the structure of the human heart.
3. Describe the flow of blood in the pulmonary circuit from the right atrium to the left atrium.
4. List the functions of coronary circulation and the hepatic portal system.
5. Describe the structure and functions of the five types of blood vessels.
6. Distinguish between vasodilation and vasoconstriction.
7. Differentiate between a heart attack and heart failure.
8. Describe three infections outside the cardiovascular system that may harm the heart.
9. Explain the measures that need to be taken to save SCA victims.

Chapter 8: Blood

1. Describe the role of red blood cells, white blood cells, platelets, and plasma.
2. Specify the three factors that determine the amount of oxygen hemoglobin binds.
3. Summarize the significance of self-markers on human body cells.
4. Distinguish between the four blood types of the ABO blood group.
5. Describe the role of Rh markers in blood agglutination.
6. List the four steps of blood clot formation.
7. Explain the consequence of embolism in human organs.
8. Describe how viruses and leukemias affect white blood cells.
9. Explain the effect of carbon monoxide on hemoglobin.

Chapter 9: Immunity and Disease

1. Describe the role of white blood cells and their chemicals in immune responses.
2. Explain the three functions of the lymph vascular system.
3. Describe the specialized role of the lymph nodes, the spleen, and the thymus for body defense.
4. Differentiate between an antibody-mediated immune response and a cell-mediated immune response.
5. Distinguish between NK cells and cytotoxic T cells.
6. Explain the significance of matching the MHC markers of
7. Evaluate the use of monoclonal antibodies in research and medicine.
8. List four common modes of transmission of infectious diseases.
9. Distinguish between the four patterns of occurrence of infectious diseases.

Chapter 10: The Respiratory System

1. Diagram the structure of the respiratory system.
2. Explain how the epiglottis prevents food from entering the respiratory tract and prevents choking.
3. Summarize how the exchange of gases takes place over the respiratory surface.
4. Explain what it means to become hypoxic.
5. Discuss the impact of a negative pressure gradient outside the lungs on the respiratory cycle.
6. Identify the cause behind infant respiratory distress syndrome.
7. Explain the role of buffers in preventing blood from becoming too acidic.
8. Explain how carbon dioxide controls the rate and depth of breathing.
9. Differentiate between carotid bodies and aortic bodies.
10. Discuss the cause and effect of apnea.
11. Explain how influenza can trigger pneumonia.
12. List three types of lung cancer.

Chapter 11: Digestion and Nutrition

1. Describe the four layers that line the digestive tube.
2. List five basic functions performed by parts of the digestive system.
3. Summarize the role of salivary enzymes in the chemical digestion of food.
4. Describe the role of the small intestine in digestion and absorption.
5. Identify the role of bile in the digestive system and the organs that produce and store it.
6. List six functions of the liver.
7. Describe the role of the large intestine in the concentration, storage, and elimination of undigested matter.
8. List the causes, effects, and treatment of hepatitis and cirrhosis.
9. Outline eight types of digestive system infections and their causes.

10. Distinguish between four main types of dietary lipids.
11. Explain the role of vitamins, minerals, and phytochemicals in the normal functioning of the body.
12. Explain the effect of genes, hormones, and activity on body weight.

Chapter 12: The Urinary System

1. Identify the mechanism that maintains stable conditions in the body's extracellular fluid.
2. Specify three special vessels that transport blood to, in, and away from nephrons.
3. Summarize the formation and discharge of urine.
4. Describe the role of the kidneys in managing fluid balance and blood pressure.
5. Explain the effect of hormones on urine concentration and blood pressure.
6. Identify the causes and effects of two serious acid–base imbalances.
7. Identify three common urinary tract infections.
8. Explain the concept of paired-kidney exchanges.

Chapter 13: The Nervous System

1. Distinguish between the three types of neurons that carry out functions of the nervous system.
2. Describe the properties of a neuron's plasma membrane that allows it to carry signals.
3. Explain the need for removal of neurotransmitter molecules from synapses.
4. Describe the structure and organization of the two main divisions of the nervous system.
5. Contrast between somatic and autonomic nerves of the peripheral nervous system.
6. Compare parasympathetic and sympathetic groups of autonomic nerves.
7. Label the three main parts of the cerebral cortex.
8. Explain the role of the limbic system in producing emotional behaviors.
9. Describe how physical injuries can damage the nervous system.
10. Describe five conditions in which infections and cancer inflame or destroy brain tissue.
11. Identify four neural disorders that affect development, behavior, and mood.

Chapter 14: Sensory Systems

1. Explain how receptors close to the body surface sense touch, pressure, and other sensations.
2. Contrast somatic pain and visceral pain.
3. Explain how the olfactory receptors function.
4. Label the three regions of the human ear.
5. Describe how the body maintains balance.
6. Describe the structure of the vestibular apparatus.
7. Discuss three disorders associated with the ear.
8. Define otitis media.
9. Describe the three layers of the eye and their functions.
10. Distinguish between the two types of photoreceptors.
11. Discuss how the retina processes visual signals.
12. Describe three eye disorders that are caused due to aging.

Chapter 15: The Endocrine System

1. Describe the chemical structures of hormones.

2. Differentiate between the functions of the posterior pituitary and the anterior pituitary.
3. Explain how the thyroid and parathyroid glands work together to regulate calcium levels in the blood.
4. Describe the role of parathyroid hormone in bone remodeling.
5. Explain how hormones from the adrenal medulla help regulate blood circulation.
6. List the three types of hormone-secreting cells contained in the pancreatic islet.
7. Describe the factors that lead to diabetes mellitus.
8. Describe the role of melatonin in the sleep/wake cycle.
9. Explain the importance of atrial natriuretic peptide in reducing the blood pressure.

Chapter 16: Reproductive Systems

1. Define endometriosis.
2. List the six steps in the ovarian cycle.
3. Discuss how substances from seminal vesicles and the prostate gland help in semen formation.
4. Explain the role of hormones in sperm formation.
5. Describe the process of fertilization.
6. Explain the role of assisted reproductive technologies in overcoming infertility.
7. Summarize the four types of sexually transmitted diseases caused by viruses.
8. Differentiate between the hepatitis B virus and the hepatitis C virus.
9. Describe four ways in which breast cancer is treated.
10. Describe how uterine and ovarian cancer affects women.
11. Explain the symptoms and cure for testicular cancer and prostate cancer.

Chapter 17: Development and Aging

1. Summarize the four stages of early embryonic development.
2. Describe the process of morphogenesis with the help of an example.
3. Describe how organ and organs systems begin to form after the gastrulation period.
4. List the functions of the four extraembryonic membranes.
5. Explain the process of lactation that occurs in a mother's mammary glands.
6. Outline the importance of IgG antibodies for pregnant women.
7. Describe three technologies that help detect genetic disorders before a child is born.
8. Summarize how aging affects the functioning of organ systems.
9. Describe how the brain functions in a person who develops Alzheimer's disease.

Chapter 18: Cell Reproduction

1. Explain the significance of DNA in the human life cycle.
2. Describe the chromosomes present in somatic cells and gametes.
3. Describe the changes that chromosomes undergo before cell division.
4. List the four stages of mitosis.
5. Outline the concerns and controversies over irradiation.
6. Explain the formation of gametes by meiosis in males and females.
7. List the two stages of meiosis.
8. Discuss the role of meiosis in genetic variation between parents and offspring.

Chapter 19: Introduction to Genetics

1. Define the role of alleles in the inheritance of traits.
2. Compare genotype and phenotype.

3. Explain why a gamete receives only one copy of each gene.
4. Describe how the mechanism of independent assortment helps explain the inheritance pattern.
5. Explain why many genetic traits do not have clear dominant and recessive forms.
6. List the effects of sickle-cell anemia.
7. Define the term penetrance with the help of an example.
8. Describe how polygenic traits result from the combined expression of genes.

Chapter 20: Chromosomes and Human Genetics

1. Outline the five steps involved in preparing a karyotype.
2. Describe the composition of the X and Y chromosomes.
3. Cite two examples of characteristics governed by sex-limited genes.
4. Examine how geneticists analyze pedigrees to predict genetic disorders.
5. Distinguish between recessive and dominant genes on autosomes.
6. List the two clues that point to the source when a recessive allele on an X chromosome causes a trait.
7. Summarize the three changes that can occur in a chromosome's structure.
8. Identify two disorders associated with the deletion of a chromosome.

Chapter 21: DNA, Genes, and Biotechnology

1. Identify the four kinds of nucleotides in a DNA molecule.
2. Compare transcription and translation of genes to proteins.
3. Diagram the three stages of the translation of mRNA into protein.
4. Diagram the five steps of the polymerase chain reaction to copy DNA.
5. Outline the outcome of mapping genes on chromosomes using examples.
6. Summarize the importance of DNA chips in the medical diagnosis and treatment.
7. Cite examples demonstrating the effectiveness of gene therapy.
8. Describe the process of cloning an adult animal.
9. Explain the difference between therapeutic cloning and reproductive cloning.

Chapter 22: Genes and Disease: Cancer

1. Distinguish between malignant tumors and benign tumors.
2. Describe the structure of cancer cells.
3. Explain the processes of division and metastasis in cancer cells.
4. Outline the roles of three types of genes responsible for the development of cancer.
5. Describe the taxonomy of cancers based on their location.
6. List seven common cancer warning signs.
7. Summarize the use of chemotherapy, adjuvant therapy, and radiation therapy in treating cancers.

Chapter 23: Principles of Evolution

1. Summarize the concept of genetic variation of gene pool.
2. Summarize the process of speciation.
3. Distinguish between genetic drift and gene flow.
4. Explain the significance of fossils and biogeography in understanding the evolution of life on Earth.
5. Explain the use of comparative morphology and the study of embryonic development to understand evolutionary history.
6. Explain the role of gene mutation in determining the proximity of species.

Chapter 24: Principles of Ecology

1. Define the terms community, biome, ecosystems, and niche.
2. Distinguish between primary succession and secondary succession.
3. Summarize the flow of energy and cycling of materials in an ecosystem.
4. Classify organisms into four categories of consumers based on their energy source.
5. Explain the flow of energy through a hierarchy of feeding levels using examples.
6. List five factors that affect the final amount of energy stored in an ecosystem.
7. Describe the movement of water, carbon, and nitrogen through their cycles in the ecosystem.

Chapter 25: Human Impacts on the Biosphere

1. List the factors resulting in the rapid increase in human population.
2. Distinguish between point and nonpoint sources of pollution.
3. Explain the importance of ozone in the earth's atmosphere.
4. Outline the problems faced by humans regarding water supply and solid waste management.
5. Summarize the impact of deforestation on the global carbon cycle.
6. Debate the use of nuclear power as a source of energy.
7. Describe the effect of human population growth on land and marine species.
8. Cite an example of the impact of biological magnification.

Completion and Accreditation

Students who pass the chapter tests with an overall average of 70% or higher will receive a certificate of completion and 11.0 Continuing Education Units (CEUs). One CEU is equivalent to 10 hours of class time.

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