

Folsom Cordova Unified School District

HUMAN ANATOMY AND PHYSIOLOGY

DATE: March 2007

SUBJECT AREA: Elective Science/Health

PROPOSED GRADE LEVEL: 11-12

COURSE LENGTH: 1 year

GRADING: A-F

NUMBER OF CREDITS: 5 per Semester

PREREQUISITES: Successful completion of biology

COURSE DESCRIPTION:

This course is designed for the student intending to pursue a career in either the health or fitness related field. The course will focus on the integration of structure and function of body systems needed to maintain homeostasis. It will integrate topics related to health and fitness such as nutrition, exercise, and kinesiology. It will also integrate specific topics related to the medical field. The course will require microscopy work as well as laboratory work involving dissections. Computers will be used to supplement laboratory work. This is primarily a laboratory science class that will cover anatomy and physiology pertaining to health and fitness.

GENERAL GOALS/PURPOSES:

At the end of the course of study the student should:

- have an understanding of the anatomy of the human body
- understand how the human body functions
- understand how the body systems are integrated to maintain balance or homeostasis
- understand how external forces in the environment can disrupt the normal functioning of the human body
- be able to demonstrate and understanding of the organization of the human body, the principles that underlie support and movement, the control systems of the body, and how the human body is maintained
- understand how nutrition, health, disease, and fitness affect the proper functioning of the human body (understand how lifestyle choices affect anatomy and physiology of the human body)
- understand the medical field's role in restoring homeostasis
- be able to understand anatomy through dissections
- be proficient in the use of PowerPoint to present topics pertaining to anatomy and physiology
- be prepared to take an introductory anatomy and physiology class at the college level
- be able to use medical terminology in discussions of human body systems

STUDENT READING COMPONENT:

Students will read proposed textbooks along with additional articles pertaining to:

- Exercise and health
- Fitness
- Nutrition, diet, and their relation to physiology
- Steroid abuse

- Drug abuse
- Medical procedures and diagnosis

Possible novels or books related to health, fitness, nutrition, and the medical field may be assigned in addition to assigned textbook and periodicals.

STUDENT WRITING COMPONENT:

- Students will write quarterly research papers related to specific topics related to health, fitness, exercise, nutrition, medicine, disease, and physiology
- Students will write a career paper related to the health or medical fields
- Students will write current event articles related to health, fitness, or medicine
- Students will have daily opportunities to analyze specific topics in anatomy and physiology through writing
- Students will have the opportunity to analyze data in laboratory work

STUDENT ORAL COMPONENT:

- Students will have several required group PowerPoint projects that will be presented in front of the class
- Students will have the opportunity for group and class discussions throughout the school year
- Students will engage in discussion of current event articles
- Students will participate in individual presentations in front of the class

DETAILED UNITS OF INSTRUCTION:

Proposed textbooks:

1. *Essentials of Human Anatomy and Physiology*, 8th edition, Marieb, 2006.
2. *Hole's Essentials of Human Anatomy and Physiology*, Shier, Butler, Lewis. 2006.

Semester 1

Unit 1: Introduction to the Human Body (1 week)

- A. Levels of organization
- B. Anatomical position, direction
- C. Body cavities, regions
- D. Concept of homeostasis

Unit 2: Cell Biology (2 weeks)

- A. Cell characteristics
- B. Cellular movement
- C. Cell Reproduction/Hereditry, DNA, protein synthesis
- D. Genes and gene expression
- E. Metabolism

Unit 3: Tissues and Organs (2 weeks)

- A. Epithelial tissue
- B. Connective tissue
- C. Muscle tissue
- D. Nervous tissue
- E. General overview of organ systems: integumentary, skeletal, muscular, nervous, endocrine, cardiovascular, lymphatic, respiratory, digestive, digestive, urinary, and reproductive systems

Unit 4: Body Membranes and Integumentary System (2 weeks)

- A. Classification of body membranes: epithelial, connective
- B. The Skin: structure, appendages, and function
- C. Applications: Physiology of sweating during exercise in maintaining body temperature, skin burns, skin cancer, aging.

Unit 5: Skeletal System (3 weeks)

- A. Organization of skeletal structure
- B. Anatomy and structure of human bones: ossification, bone type, joint types
- C. Function: support, protection, movement, hemopoiesis, growth
- D. Applications: understanding kinesiology, affects of exercise on bone growth, life style choices that affect bone structure and growth, and physical therapy applications.

Unit 6: Muscular System (4 weeks)

- A. Muscle tissue
- B. Characteristics of muscle tissue types
- C. Functions of skeletal muscle: movement, posture, heat production
- D. Muscle fatigue (exercise)
- E. Effects of exercise on skeletal muscle
- F. Muscle stimulation, and contraction: types of contraction
- G. Anatomy of major human muscle groups
- H. Application: kinesiology, physical therapy, diseases of muscles, affects of exercise, fitness, and nutrition on muscle growth and general fitness; discussions of anabolic steroids and muscle growth

Unit 7: Nervous system (4 weeks)

- A. Cells of the nervous system
- B. Organs and divisions of the nervous system
- C. Nerves, nerve impulses, the synapse
- D. Central nervous system: function and anatomy
- E. Peripheral nervous system: functions and anatomy
- F. Autonomic nervous system: functions and anatomy
- G. The senses: sense organ anatomy and function
- H. Physiology of nervous system control and homeostasis
- I. Applications: Affects of drug use and the nervous system, diseases of the nervous system, nutrition and the nervous system, and physiology of nervous control during exercise

Semester 2

Unit 8: Endocrine System (2 weeks)

- A. Gland and endocrine tissue anatomy and function
- B. Hormone mechanism of control
- C. Positive and negative feedback loops
- D. Homeostatic control
- E. Applications: physiology of pregnancy and child birth, endocrine system and puberty, endocrine system and exercise

Unit 9: Blood and the Cardiovascular System (4 weeks)

- A. Blood anatomy and function
- B. Blood system
- C. Heart and vessels
- D. Cardiopulmonary and systemic circulation
- E. Blood pressure/pulse

F. Fluid and electrolyte balance (exercise and electrolyte balance)

F. Application: Circulatory system in relationship to health and fitness: issues of cholesterol, heart attack, heart disease, and exercise.

Unit 10: Respiratory System (2 weeks)

A. Anatomy and function

B. Structure: respiratory tract, muscles

C. Physiology of respiration

D. Regulation of respiration

E. Buffers, respiratory mechanism of pH control

F. Applications: respiratory functioning during exercise, benefits of exercise on the respiratory system; discussion of respiratory disease: asthma

Unit 11: Lymphatic System and Immunity (2 weeks)

A. Structure and function of lymphatic system

B. Immune system: function, nonspecific and specific immunity

C. Applications: vaccines, disease, HIV

Unit 12: Digestive System (3 weeks)

A. Structure and Function: major tissues and organs

B. Physiology of digestion

C. Nutrition and metabolism

D. Applications: nutrition, exercise and metabolism etc.

Unit 13: Urinary System (2 weeks)

A. Major organs structure and function: kidneys and bladder.

B. Kidney structure and physiology: Nephron function

C. Formation of urine

D. Urinary mechanism of pH control

D. Applications: maintaining fluid balance (water balance) during exercise

Unit 14: Reproductive system (2 weeks)

A. Male

B. Female

C. Development

Unit 15: Integration of Body Systems (2 weeks)

A. How body systems are integrated

B. Integration and relevancy to exercise physiology

C. Homeostasis

D. Disease and systems integration, medical diagnosis

THIS COURSE WILL PREPARE STUDENTS FOR THE CAHSEE AND/OR THE FCUSD EXIT EXAMS:

Writing, Reading, Science

LAB FEE, IF REQUIRED:

None

SUBJECT AREA CONTENT STANDARDS TO BE ADDRESSED:

Physiology

As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:

- a. *Students know* how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
- b. *Students know* how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
- c. *Students know* how feedback loops in the nervous and endocrine systems regulate conditions in the body.
- d. *Students know* the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
- e. *Students know* the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.
- f. *Students know* the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, and lipases), stomach acid, and bile salts.
- g. *Students know* the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
- h. *Students know* the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2} , and ATP.
- i. *Students know* how hormones (including digestive, reproductive, and osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:

- a. *Students know* the role of the skin in providing nonspecific defenses against infection.
- b. *Students know* the role of antibodies in the body's response to infection.
- c. *Students know* how vaccination protects an individual from infectious diseases.
- d. *Students know* there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
- e. *Students know* why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.
- f. * *Students know* the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

Cell biology

The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:

- a. *Students know* cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
- b. *Students know* enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.

- c. *Students know* how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
- d. *Students know* the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
- e. *Students know* the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.
- f. *Students know* usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
- g. *Students know* the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.
- h. *Students know* most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.
- i. * *Students know* how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.
- j. * *Students know* how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.

Genetics

Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:

- a. *Students know* the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
- b. *Students know* how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
- c. *Students know* how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
- d. *Students know* specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
- e. *Students know* proteins can differ from one another in the number and sequence of amino acids.
- f. * *Students know* why proteins having different amino acid sequences typically have different shapes and chemical properties.

The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:

- a. *Students know* the general structures and functions of DNA, RNA, and protein.
- b. *Students know* how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.

DISTRICT ESLR'S TO BE ADDRESSED:

Students will be:

- **Self-Directed Learners:** who will be able to utilize their knowledge of anatomy and physiology to understand its relation to health and fitness and be able to integrate knowledge of physiology and anatomy in lifestyle choices.

- **Effective Communicators:** who will be able to use PowerPoint to convey cogent arguments with proper public speaking skills on topics related to physiology and lifestyle.
- **Quality Producers/Performers:** who will take pride in the quality of their work and who will use time management and organizational skills to produce quality product.
- **Constructive Thinkers:** who are able to take learned information and integrate it into a construct, a holistic perspective, that allows for free and independent thought processes when dealing with health/fitness, and physiology.
- **Collaborative Workers:** who are able to work cooperatively and collaboratively with a wide diversity of fellow students to facilitate an understanding of the coursework.
- **Responsible Citizens:** who practice democratic values with integrity and responsibility within the classroom to help foster a positive learning environment for all anatomy and physiology students.