

CENTRAL TEXAS COLLEGE
BIOL 2401
ANATOMY AND PHYSIOLOGY I

Semester Hours Credit: 4

INSTRUCTOR: _____

OFFICE HOURS: _____

I. INTRODUCTION

- A. Anatomy and Physiology I is the first part of a two course sequence. It is a study of the structure and function of the human body including cells, tissues and organs of the following systems: integumentary, skeletal, muscular, nervous and special senses. Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis.
- B. This course is designed primarily for the career nursing and med-tech student but might satisfy requirements for other curricula in the allied health fields.
- C. Anatomy and Physiology I is a technical course with heavy emphasis on vocabulary building. The course of study includes learning the structure of major body systems. Basic functions of these systems will be discussed as they relate to structure.
- D. Prerequisites: None. Co-requisite: BIOX 2401.
Completion of BIOL 1406 and developmental courses is recommended.

II. LEARNING OUTCOMES

Lecture

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

- A. Use anatomical terminology to identify and describe locations of major organs of each system covered.
- B. Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- C. Describe the interdependency and interactions of the systems.

- D. Explain contributions of organs and systems to the maintenance of homeostasis.
- E. Identify causes and effects of homeostatic imbalances.
- F. Describe modern technology and tools used to study anatomy and physiology.

Laboratory

- A. Apply appropriate safety and ethical standards.
- B. Locate and identify anatomical structures.
- C. Appropriately utilize laboratory equipment, such as microscopes, dissection tools, general lab ware, physiology data acquisition systems, and virtual simulations.
- D. Work collaboratively to perform experiments.
- E. Demonstrate the steps involved in the scientific method.
- F. Communicate results of scientific investigations, analyze data and formulate conclusions.
- G. Use critical thinking and scientific problem-solving skills, including, but not limited to, inferring, integrating, synthesizing, and summarizing, to make decisions, recommendations and predictions.

III. INSTRUCTIONAL MATERIALS

- A. Required Textbook: Marieb, Elaine N. and Hoehn, Katja. *Human Anatomy & Physiology with Mastering A&P bundled with Brief Atlas of the Human Body and Interactive Physiology* 10/e Bundle ISBN: 9781323568897 or Marieb, *Mastering A&P Stand Alone Access Card with E-text for Marieb, Human Anatomy & Physiology* 10/e ISBN: 9780133994971 (all digital access through the bookstore)
- B. Required Laboratory Manual: Biol 2401 Anatomy and Physiology I Lab Manual. Central Texas College, 2017.
- C. Required: Access to Modified Mastering Anatomy and Physiology website. Access is included with new book or can be purchased at the bookstore or website if using a used book. If a textbook is obtained from another source, online access can be purchased at www.pearsonmylabandmastering.com If purchased direct via Modified Mastering it can be with e-text or without.

- D. The instructional materials identified for this course are viewable through www.ctcd.edu/books

IV. COURSE REQUIREMENTS

- A. This course is technical and the terminology involved requires a great deal of study time. Memorization is necessary, but understanding must result as the final product.
- B. You are expected to read all assigned materials and to bring your textbook to class and the laboratory. Read ahead before ALL labs so you are familiar with the material when you arrive in lab.
- C. You are expected to keep a good set of notes. There is more information covered in your textbook than we cover in lecture or lab. You must use your textbook, class notes and lab manual to help you focus your studies on the required material. The vocabulary in this course is extensive and precise. Proper spelling is a requirement.
- D. Instructor office hours are posted outside the instructor's office door. If none of the available hours fit with your schedule, a special conference may be scheduled.

V. EXAMINATIONS AND SEMESTER GRADE COMPUTATIONS

- A. Point distribution in the course:
- | | |
|-------------------------------------|-------------------|
| Lecture exams (4 @ 100 points each) | 400 points |
| Mastering A&P | 100 points |
| Lab exams (5 @ 100 points each) | <u>500 points</u> |
| | 1000 points |
- B. Percentage and points used to compute final semester grades:
- | | |
|----------------------------|---|
| 90%-100% (900-1000 points) | A |
| 80%-89% (800-899 points) | B |
| 70%-79% (700-799 points) | C |
| 60%-69% (600-699 points) | D |
| 0%-59% (0-599 points) | F |
- C. No makeup exams will be given. A comprehensive final exam can substitute for a missed exam. If you have taken all exams, you may take the final to substitute for your lowest exam grade. If you miss more than one exam, you will not be able to make up the points. Students must be on time for all exams. Students arriving more than 10 minutes past the

scheduled exam time will not be permitted to take the exam and will receive a 0.

- D. All lab exams are fill-in-the-blank. Spelling does count and each spelling error deducts ½ point. Lecture exams include fill-in-the-blank, multiple choice, and short essay questions. Spelling errors may be deducted.
- E. Cell phone and other electronic devices must be turned off and placed **out of sight** during exams.
- F. **CHEATING IS TAKEN VERY SERIOUSLY.** Cheating in any form will not be tolerated. The CTC catalog is clear regarding the consequences of cheating: “Students guilty of scholastic dishonesty will be administratively dropped from the course with a grade of ‘F’ and subject to disciplinary action, which may include suspension and expulsion.” A formal charge against the student may be made to the College Disciplinary Board.

Cheating is defined as an act of:

- a. Giving, receiving, and/or aiding in either the giving or receiving of any unauthorized information during testing
- b. Communicating the contents, general or specific, of any test or quiz to include the lending or borrowing of past tests or quizzes when the instructor has not specifically sanctioned this act
- c. Using in the testing area any covert and unacceptable means of receiving or giving information

VI. NOTES AND ADDITIONAL INSTRUCTIONS

- A. **Course Withdrawal:** (Consistent with CTC policy)
- B. **Administrative Withdrawal:** (Consistent with CTC policy)
- C. **Incomplete grade:** (Consistent with CTC policy)
- D. **Americans with Disabilities (ADA) statement:** The Disability Support Services Program provides services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the main campus. This service is available to all students, regardless of location. Explore the website at <http://www.ctcd.edu/disability-support> for further information. Reasonable accommodations, in accordance with federal and state laws, will be given through the DSS office.

- E. **Faculty Response Time to Student Communication:** Instructors will respond to student communication within 48 hours [two business days] during the “conventional” business week unless extenuating circumstances warrant otherwise. The instructor often can reply sooner and will reply sooner if able. Use the table below to determine the latest time in which you will receive a response.

Communication received	Expect a response
Monday through Thursday	Within 48 hours
Friday	By 12 noon the following Monday
Saturday and Sunday	By 5:00 PM the following Tuesday

- G. **Instructor Discretion:** The instructor reserves the right of final decision in course requirements.
- H. **Civility:** Individuals are expected to be cognizant of what a constructive education experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.
- I. **Cellular Phones and Beepers:** Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

VII. COURSE OUTLINE

Note: some units are much longer than others. Units do not correspond to a certain number of lectures.

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A. **UNIT ONE:** The human organism—an overview

1. **Learning Outcomes:** Upon successful completion of this unit, the student will:

- a. List the levels of organization of living organisms.
- b. Explain major life processes and the requirements of living organisms with examples
- c. Identify the functions and major organs of the human systems.
- d. Identify the major body cavities and the abdominal regions.
- e. Apply directional terms and planes of reference to the human body
- f. Define the anatomical position and identify regions of the body.
- g. Identify the major organs of the human body evident on laboratory
- h. models and in pictures.
- i. Identify symbols for important atoms and ions in biological systems.
- j. Identify the parts of the atom and explain what occurs when atoms become involved in covalent, ionic, and hydrogen bonds.
- k. Use structural and molecular formulas and manipulate structural models to illustrate important inorganic and small organic molecules.

2. **Learning Activities:**

- a. Classroom lecture
- b. Reading assignment: Chapters 1 and 2 in text.
- c. Reading for labs 1 and 2 in lab manual.
- d. Mastering A&P study resources
- e. Check your understanding questions in lab manual.

B. UNIT TWO: Molecular and cellular structure of living things: Water and solutions; basic biochemistry; cell structure; cell membranes and transport; homeostasis; using the microscope; tissues

1. **Learning Outcomes:** Upon successful completion of this unit, the student will:

- a. Describe the structure and properties of water molecules. Explain why water is important in living organisms.

- b. Describe the pH scale and give examples of the pH of various body solutions. Describe and illustrate the behavior of acids, bases and salts in aqueous solutions.
- c. Define osmosis, hypotonic, hypertonic and isotonic solutions, and explain the effects of these solution types on cells.
- d. List the 4 major groups of macromolecules, their elements, and examples of each.
- e. Discriminate between anabolic (synthesis) and catabolic (decomposition) for each of the four major groups of macromolecules. Discriminate between exchange (double/single replacement) reactions and reversible reactions
- f. Describe major functions of the various macromolecules in living systems.
- g. Describe the structure of a typical cell. Sketch and label the parts of the cell.
- h. Describe the functions of the cell membrane and the molecules that control these functions.
- i. Discuss the various transport processes used at the membrane level.
- j. Describe the structure and function of the major organelles.
- k. Discuss the purpose of meiosis and mitosis and the cell types that perform these processes.
- l. Identify the different parts of the cell cycle, including the stages of mitosis, in the microscope and discuss what occurs during each phase.
- m. Describe the major features of the 4 basic tissue types.
- n. Compare and contrast the features of epithelial tissues, how they are classified, and the position and importance of the basement membrane.
- o. Compare and contrast each of the 5 common epithelial types identified in the lab manual.
- p. Compare and contrast the characteristics of connective tissues including ground substance and fibers.
- q. Identify the major types of connective tissues under the microscope including fiber types and features noted in the lab manual.
- r. Define and give examples of homeostasis.
- s. Proficiently operate a microscope and calculate specimen magnification.

2. Learning Activities:

- a. Classroom lecture.
- b. Read chapters 2, 3, and 4 in text
- c. Reading and activities for labs 3-6 in lab manual.
- d. Laboratory practice in use of microscope.
- e. Mastering A&P study resources
- f. Check your understanding questions in lab manual.

C. UNIT THREE: The integument (skin)

1. **Learning Outcomes:** Upon successful completion of this unit, the student will:

- a. Describe the three main layers of the integument.
- b. Describe the strata of the epidermis and relate their structure to the events that occur as cells of the epidermis mature.
- c. Describe the structure of the dermis and hypodermis.
- d. List the accessory structures (epidermal derivatives) and their functions.
- e. Describe the functions of the integument and the structures that contribute to the overall functions.
- f. Compare and contrast the various types of glands and nerve endings in the integument. Sketch these structures in the lab manual.
- g. Describe how skin is pigmented and why pigmentation changes.
- h. Recognize homeostatic imbalances that occur with the integument.
- i. Recognize the epidermal strata in slides and models.
- j. Identify the regions of the dermis in slides and models.
- k. Identify specific nerve endings and glands as outlined in the lab manual.
- l. Identify the regions of the hair.

2. **Learning Activities:**

- a. Classroom lecture.
- b. Read chapter 5 in text; reading on lab 7 (integument) in lab manual.
- c. Label skin diagram in lab manual.
- d. Check your understanding questions in lab manual.
- e. Mastering A&P study resources

D. UNIT FOUR: Bones and joints

1. **Learning outcomes:** Upon successful completion of this unit, the student will:

- a. Describe the functions of bone.
- b. Describe and give examples of the types of bones.
- c. Sketch, label, and describe the structure of a long bone including the surrounding layers.
- d. Compare and contrast the structure of spongy and compact bone.
- e. Discuss the composition and maintenance of bone matrix.
- f. Describe the processes of intramembranous and endochondral ossification.

- g. Describe the function of the epiphyseal plate and sequence the timing of endochondral ossification.
- h. Define and give examples of the major joint types.
- i. Describe and give examples of the 6 types of synovial joints.
- j. Relate the angular and special movements to the joint type where they are produced.
- k. Discuss the composition and function of synovial fluid.
- l. Sketch and describe the structure of the joint capsule and associated features.
- m. Identify common joint injuries.
- n. Differentiate between the axial and appendicular skeleton.
- o. Identify the cranial sutures and fontanelles.
- p. Identify the bones and features of the cranium.
- q. Identify the facial bones and features.
- r. Identify the major regions of the vertebral column, name the vertebrae according to their number and region, and identify the features of a single vertebra.
- s. Identify the features of the thorax.
- t. Identify the bones and features of the upper extremity, lower extremity, pectoral girdle, and pelvic girdle.

2. **Learning activities:**

- a. Classroom lecture.
- b. Read chapters 6, 7, and 8 in text.
- c. Reading and lab exercises on skeletal system.
- d. Check your understanding questions for skeletal system in lab manual.
- e. Mastering A&P study resources

E. UNIT FIVE: Myology

1. **Learning outcomes:** Upon successful completion of this unit, the student will:

- a. Compare and contrast skeletal, smooth, and cardiac muscle.
- b. Explain the functions of muscles and the terms origin, insertion, and action.
- c. Describe the macroscopic and microscopic features of muscle tissue.
- d. Sequence the events that occur during skeletal muscle contraction and the changes that take place in the sarcomere.
- e. Distinguish between the various types of muscle fibers.
- f. Differentiate between the types of contractions and the ability to change force production.
- g. Discuss the sequence of events that occur during smooth muscle contraction.

- h. Compare the microscopic structure of smooth, skeletal, and cardiac muscle.
- i. Identify the muscles on the muscle models using the muscle tables in your lab manual as a guide.
- j. Complete the muscle tables and learn the origin, insertion, and action for the required muscles.
- k. Identify the muscles, ligaments, joints, and cartilage that stabilize the knee joint.

2. Learning activities:

- a. Classroom lecture.
- b. Read chapters 9 and 10 in text.
- c. Reading and lab exercises on muscles.
- d. Mastering A&P study resources
- e. Check your understanding questions on muscles in lab manual.

F. UNIT SIX: Nervous System

1. Learning Outcomes: Upon successful completion of this unit, the student will:

- a. Summarize and diagram the organization of the nervous systems in both structure and function.
- b. Draw and describe the structure of a typical neuron and identify neuron structures under the microscope
- c. Compare and contrast the structural and functional classifications of neurons.
- d. Classify the various types of glial cells and describe their functions.
- e. Compare and contrast graded and action potentials.
- f. Draw a graph of a typical action potential in a neuron axon. Relate the phases of the graph to the changes in ion movement across the cell membrane.
- g. Describe the factors that influence rate of transmission in the axon.
- h. Explain how myelination influences conduction and how it is formed in the central and peripheral nervous systems.
- i. Distinguish between chemical and electrical synapses.
- j. Describe the major neurotransmitter categories including examples of neurotransmitters and receptors in each category.
- k. List the major brain regions and describe the major functions of each region including higher mental functions, memory, and sleep.
- l. Identify major brain regions and features on the dissected brain and brain models.
- m. Describe the mapping of the cortex for both motor function and somatosensory function.
- n. Explain the brainstem control centers including their functions.

- o. Explain how an EEG can demonstrate brain function.
- p. Describe and identify the structure and function of the meninges.
- q. Explain how cerebrospinal fluid (CSF) is produced, its circulation, and major functions.
- r. Describe the structure of the spinal cord and explain how information is sent through the various ascending and descending pathways.
- s. Explain the divisions of the peripheral nervous system.
- t. Identify the major regions of the spinal cord including under the microscope.
- u. Explain the organization of the somatosensory system to generate sensation and perception.
- v. Describe the structure of a peripheral nerve and the classification of the nerves as sensory, motor, or mixed.
- w. Explain the components of the reflex arc and be able to apply those to various types of reflexes. Be able to classify a reflex as somatic or autonomic.
- x. Describe and locate the 12 pairs of cranial nerves and know structures innervated by each.
- y. Describe the major spinal plexuses, the spinal nerves that form them, and major structures innervated by them.
- z. Describe motor endings and the hierarchy of motor control.
- aa. Differentiate between the sympathetic and parasympathetic nervous systems in CNS origination, pathways, neurotransmitters used, effector organs and their physiological effects.
- bb. Compare and contrast the pathways of the somatic division and the autonomic division.
- cc. Explain in detail the differences between cholinergic and adrenergic receptors, including subcategories of each. Give examples of where each receptor type is found and how they create their effects.
- dd. Describe how homeostasis is maintained using the autonomic nervous system and how the two divisions interact together to fulfill the control mechanisms.
- ee. Describe the structure of the eye and the pathway of light as it moves through the structures of the eye.
- ff. Explain how the process of accommodation alters the lens shape and thus the focal point for both normal and common abnormal vision patterns.
- gg. Describe the layers of the retina and the functions of the major types of photoreceptors. Explain the role of each in phototransduction
- hh. Describe the neural pathway for vision.
- ii. Explain the role of special chemoreceptors for the olfactory and taste sensation and give the neural pathway for each sense.
- jj. Describe the structure of the ear and the location of the receptors for sound and equilibrium.
- kk. Explain the properties of sound waves and how the ear carries out the transduction of sound.

- ll. Explain which portions of the ear function in equilibrium and orientation and the mechanism by which they change stimuli into neural signals.
- mm. Identify structures of the eye in models, dissections, and microscopes.
- nn. Identify structures of the ear on models.

2. Learning activities:

- a. Classroom lecture.
- b. Read chapters 11-15.
- c. Lab exercises on the nervous system.
- d. Test sensory feedback mechanisms and various reflex arcs for appropriate responses.
- e. Perform various vision tests to apply physiological principles of the eye and phototransduction.
- f. Perform other tests for senses.
- g. Mastering A&P study resources
- h. Check your understanding questions in lab manual.