

Anatomy and Physiology 1

Course Outcome Summary

Course Information

Developers	Gary Johnson, Victor Johnson, Deborah Wiepz
Development Date	3/28/2000
Revised Date	5/15/2000
Course Number	20-806-207
Instructional Level	College Parallel
Potential Hours of Instruction	90
Total Credits	4

Description

Features lectures and laboratory dealing with the human body as an integrated structural and functional unit, including basic anatomical and directional terminology, fundamental concepts and principles of cell biology, histology, integumentary, skeletal, muscular, endocrine and nervous systems, and the special senses. Includes dissection of various fresh and preserved materials as well as examination of a human cadaver. This course is the first semester of a two-semester sequence. College-level chemistry is recommended. Introductory college level biology course recommended.

Target Population

Students enrolled or planning to enroll in programs such as nursing, respiratory therapy, occupational therapy and other allied health fields that involve direct patient care. College transfer students needing a 4-credit Natural Science course with a laboratory.

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	54	4
On Campus Laboratory	36	

Textbooks

Tortora & Grabowski. *Principles of Anatomy & Physiology*. Harper & Row. **Edition:** 8th. **Source:** MATC Bookstore.

Staff. *Lecture Handouts (806-207) - Anatomy & Physiology I*. MATC. **Edition:** Current. **Source:** MATC Bookstore.

Staff. *Laboratory Manual (806-207) - Anatomy & Physiology I*. MATC. **Edition:** Current. **Source:** MATC Bookstore.

Twietmeyer & McCracken. *Coloring Guide to Regional Human Anatomy*. Lea & Febiger. **Edition:** 2nd. **Source:** MATC Bookstore.

Learner Supplies

Lecture Tapes (806-207) - Anatomy & Physiology I. **Manufacturer:** ---. **Source:** MATC Bookstore.

True/False Self-Testing Program. **Manufacturer:** ---. **Source:** MATC Bookstore.

Prerequisites

One Year of High School Chemistry OR One Semester of College Level Chemistry

Exit Learning Outcomes

Core Abilities

- A. Communication
- B. Critical thinking
- C. Science and Technology

Competencies

Unit 1. Basic Anatomical Terminology

A. Apply descriptive, anatomical, and directional terminology

Linked Core Abilities

Communication
Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam
- A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- A.1. you distinguish between anatomy and physiology
- A.2. you examine directional terms used in the study of anatomy and physiology of the human body
- A.3. you identify the major planes of the body or of an organ
- A.4. you explore anatomical position
- A.5. you summarize the axial and appendicular regions of the body
- A.6. you examine the terms thoracic cavity and abdominal cavity

Unit 2. Homeostasis

A. Examine the basic concept of homeostasis and body homeostatic mechanisms as they apply to body systems

Linked Core Abilities

Communication
Critical thinking
Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam

Criteria - Performance will be satisfactory when:

- A.1. you summarize the term homeostasis
- A.2. you identify the essential components of a feedback system or loop
- A.3. you examine the two major body systems responsible for feedback control mechanisms

- A.4. you explain the concepts of both negative feedback and positive feedback systems including their effects on maintaining or disrupting homeostasis
- A.5. you use specific examples to discuss how the hypothalamus and/or pituitary gland function to maintain homeostatic levels of hormones in the blood

Unit 3. Chemical Level of Organization

A. Summarize the organization of the human body

Linked Core Abilities

Communication

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

Criteria - Performance will be satisfactory when:

A.1. you summarize the basic levels of organization that characterize living things beginning with the subatomic particles and ending with the multicellular organism

A.2. you summarize the molecular level of organization

A.3. you summarize the organelle level of organization

A.4. you summarize the cellular level of organization

A.5. you summarize the tissue level of organization

A.6. you summarize the organ level of organization

A.7. you summarize the organ system level of organization

A.8. you summarize the whole organism level of organization

A.9. you arrange in order the major types of body structures from simplest to most complex

B. Summarize the structure and function of the major chemical components of living things

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

B.1. in the evaluation of written answers to study questions

B.2. in the evaluation of a multiple choice exam

B.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

B.1. you summarize the term element

B.2. you examine the four naturally occurring elements most abundant in living organisms giving the average percent abundance of each

B.3. you summarize at least six other naturally occurring elements found in the body

B.4. you summarize the term atom

B.5. you summarize the structure of an atom

B.6. you compare and contrast atomic number with atomic mass and atomic weight

B.7. you summarize the two main types of chemical bonds that join atoms into molecules

B.8. you examine covalent bonding

B.9. you summarize ionic bonding

- B.10. you summarize the term polar as it relates to molecules
- B.11. you explain how the molecular structure of water molecules causes them to be polar
- B.12. you summarize hydrogen bonding
- B.13. you examine examples of situations or processes dependent on hydrogen bonding
- B.14. you explain why the polar nature of water molecules makes water a good solvent
- B.15. you explain why the polar nature of water molecules causes water to have a high specific heat
- B.16. you summarize the broad categories of organic molecules that are especially important to the human body and the subunits that the molecules in each category are synthesized from or digested into
- B.17. you explain the chemical composition of a monosaccharide
- B.18. you summarize the monosaccharides especially important to the human body
- B.19. you summarize the terms disaccharide and polysaccharide listing specific examples of each
- B.20. you summarize the uses of carbohydrates in the body
- B.21. you explain the chemical composition of a fatty acid
- B.22. you contrast the charge characteristics of a neutral lipid with a phospholipid
- B.23. you summarize the uses in the body of neutral lipids, phospholipids, and steroids
- B.24. you summarize the term acid listing characteristics of acids
- B.25. you summarize the term base listing characteristics of bases
- B.26. you summarize the term salt giving an example of a salt
- B.27. you summarize the range of the pH scale describing how pH values relate to the hydrogen ion concentration and the acid/base level of a solution
- B.28. you summarize the normal pH range for arterial blood
- B.29. you summarize the terms acidemia and alkalemia describing their effects on the body
- B.30. you summarize the structural formula for an amino acid
- B.31. you explain how peptide bonds join amino acids together to form proteins
- B.32. you summarize the terms catalyst, coenzyme/cofactor, and active site as they relate to enzyme activity
- B.33. you explain how enzymes function, including at least eight general statements related to their activity
- B.34. you summarize the uses of proteins in the body, other than as enzymes

Unit 4. Cellular Level of Organization

A. Characterize the basic structure and functions of the cell and its parts

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

Criteria - Performance will be satisfactory when:

- A.1. you summarize the structure of a living membrane
- A.2. you summarize the terms selective permeability and fluid mosaic as they relate to membranes
- A.3. you summarize membrane functions
- A.4. you summarize factors that can affect membrane permeability explaining the reason each factor could increase or decrease permeability
- A.5. you explain how carrier molecules function using their created diagram to illustrate their description
- A.6. you distinguish between active carrier-aided transport with passive carrier-aided transport, giving an example of a specific substance moved within the body by each process
- A.7. you summarize the term diffusion
- A.8. you summarize the term concentration gradient
- A.9. you explain how molecules diffuse across a membrane and explain why diffusion occurs
- A.10. you summarize examines specific substances that routinely cross cell membranes by diffusion
- A.11. you summarize the terms solvent and solute giving a specific of each in the human body
- A.12. you summarize the terms hypertonic, hypotonic, and isotonic
- A.13. you summarize the term osmosis
- A.14. you explain how water molecules cross a membrane by osmosis and explain why osmosis occurs
- A.15. you explain how osmosis can cause intracellular pressure to increase or decrease with regard to solute concentrations both inside and outside the cell
- A.16. you summarize the term organelle
- A.17. you explain the structure and function of each of the various organelles typical of living human cells

B. Summarize how cells store and use energy

Linked Core Abilities

Communication
 Critical thinking
 Science and Technology

Competence will be demonstrated:

- B.1. in the evaluation of written answers to study questions
- B.2. in the evaluation of a multiple choice exam

Criteria - Performance will be satisfactory when:

- B.1. you write the equations for ATP synthesis and breakdown
- B.2. you explain why ATP is a better source of energy for most cell activities than is glucose
- B.3. you summarize the basic accomplishments of cellular respiration and explain how each is achieved
- B.4. you summarize the role of mitochondria in cellular respiration

C. Analyze the roles of DNA and RNA in controlling cell functions

Linked Core Abilities

Communication
 Critical thinking

Science and Technology

Competence will be demonstrated:

- C.1. in the evaluation of written answers to study questions
- C.2. in the evaluation of a multiple choice exam
- C.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- C.1. you analyze the chemical structure of both DNA and RNA
- C.2. you analyze the process of transcription
- C.3. you analyze the process of replication
- C.4. you summarize the basic function of the three major types of RNA
- C.5. you analyze the process of protein synthesis
- C.6. you explain how a change in a cells DNA can ultimately result in a change in the activity of one of that same cells proteins
- C.7. you summarize the term mitosis
- C.8. you analyze three different patterns of mitotic activity that cells in the human body display giving a specific example of a cell type that displays each pattern
- C.9. you contrast the terms chromatin and chromosome
- C.10. you specify whether the chromatin state or the chromosome state of DNA is most advantageous to cells that are dividing explaining why
- C.11. you specify whether the chromatin state or the chromosome state of DNA is most advantageous to cells that are not actively dividing explaining why

Unit 5. Tissue Level of Organization

A. Relate the structure and functions of tissues to the organs they comprise

Linked Core Abilities

Communication

Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam
- A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- A.1. you summarize the term tissue
- A.2. you summarize the four basic categories of tissues
- A.3. you summarize the general characteristics of epithelial tissues
- A.4. you summarize the structural features which are the basis for naming epithelia
- A.5. you summarize the structure and uses of the different specific types of epithelia giving an example of where each could be found in the body
- A.6. you summarize the term matrix as it relates to connective tissues
- A.7. you summarize the general characteristics of connective tissues
- A.8. you summarize the structure and uses of the different specific types of connective tissues giving an example of where each could be found in the body
- A.9. you summarize the different types of muscle tissue giving an example of where each could be found in the body
- A.10. you analyze the different types of tissues on the basis of their microscopic anatomy
- A.11. you compare and contrast the microscopic appearance of the different types of

tissues

Unit 6. Integumentary System

A. Relate the major gross and microscopic anatomical components of the integumentary system to their functions

Linked Core Abilities

Communication

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

A.1. you summarize the two major layers of the skin stating the thickness and the primary tissue type of each layer

A.2. you summarize the most common subcutaneous tissues

A.3. you summarize the basic functions of the skin

A.4. you analyze the anatomy and specific functions of the stratum basale

A.5. you analyze the anatomy and specific functions of the stratum corneum

A.6. you summarize the major changes that usually occur in the anatomy and physiology of a cell as it moves from the stratum basale to the stratum corneum

A.7. you summarize the process and the advantages of the sun tan reaction

A.8. you examine the structure, growth patterns, and functions of hairs

A.9. you summarize the production and functions of sebum identifying skin problems related to its secretion

A.10. you summarize two types of sweat glands contrasting their functions

A.11. you compare and contrast first, second, and third degree burns

A.12. you summarize the most life threatening problems associated with severely damaged skin, such as in severe burn victims

Unit 7. Skeletal System

A. Relate the major gross and microscopic anatomical components of the skeletal system to their functions

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

A.1. you summarize the basic functions of the skeletal system

A.2. you analyze the anatomy of a typical growing long bone

A.3. you summarize the functions of the long bone structures labeled above

A.4. you contrast an open fracture with a closed fracture

A.5. you summarize the different specific types of bone fractures

- A.6. you examine the stages of bone repair
- A.7. you analyze intramembranous ossification relating the term fontanel to this process
- A.8. you analyze endochondral ossification relating the term epiphyseal plate to this process
- A.9. you explain how long bones continue to grow in width and length during childhood and adolescence
- A.10. you examine hormones that influence bone formation and growth stating the production site and specific actions for each hormone
- A.11. you summarize the structure of a fibrous joint giving examples
- A.12. you summarize the structure a cartilaginous joint giving examples

Unit 8. Nervous System

A. Relate the major gross and microscopic anatomical components of the nervous system to their functions

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam
- A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- A.1. you summarize the basic functions of the nervous system
- A.2. you summarize the anatomical and physiological subdivisions of the nervous system
- A.3. you contrast neurons and neuroglial cells
- A.4. you summarize the functions of different types of neuroglial cells
- A.5. you explain the functional roles of the nerve cell body, axons, and dendrites
- A.6. you explain the composition, formation, and functions of the myelin sheath
- A.7. you explain what is meant by the term neurolemma
- A.8. you contrast the anatomy of a neuron and a nerve
- A.9. you summarize the terms polarization, membrane potential, and resting potential as they relate to a neuron
- A.10. you examine an average resting potential explaining the physiological basis for this condition
- A.11. you summarize the terms action potential, threshold potential, excitatory stimulus, and inhibitory stimulus
- A.12. you contrast an excitatory stimulus, an action potential, and a nerve impulse
- A.13. you summarize the chemical changes that occur during each phase of an action potential explaining the physiological basis for each of these changes
- A.14. you summarize the term refractory relating it to the phases of an action potential
- A.15. you contrast the terms absolutely refractory and relatively refractory
- A.16. you explain propagation of a nerve impulse
- A.17. you summarize the process of synaptic transmission
- A.18. you distinguish between the terms synapse, neuromuscular junction, and

neuroglandular junction

- A.19. you summarize the two broad categories of neurotransmitter
- A.20. you summarize the specific neurotransmitter found at various neuromuscular junctions and peripheral synapses
- A.21. you summarize examples of chemical transmitters that have been identified at various CNS synapses
- A.22. you examine various ways that drugs could effect synaptic activity
- A.23. you summarize examples of stimulants, depressants, and mixed action drugs
- A.24. you distinguish between threshold, subthreshold, and suprathreshold excitatory stimuli in terms of the effects on a neuron
- A.25. you explain the term summation including specific methods by which summation can occur
- A.26. you relate summation to the concept of synaptic resistance including the significance of synaptic resistance to nervous system function
- A.27. you distinguish between synaptic delay and synaptic fatigue
- A.28. you identify features of neuron anatomy that influence impulse conduction rate including a statement of how each effects conduction rate
- A.29. you identify the regions of a human brain
- A.30. you summarize the major functions of the regions of a human brain
- A.31. you distinguish between gray matter and white matter
- A.32. you summarize the different anatomical forms that neurons may have
- A.33. you summarize the different functional types of neurons
- A.34. you examine a cross-sectional view of the spinal cord
- A.35. you examine a typical three-neuron reflex arc
- A.36. you summarize the terms ascending tract/column and descending tract/column in reference to the spinal cord
- A.37. you summarize the major ascending tracts/columns
- A.38. you summarize the major descending tracts/columns
- A.39. you distinguishes between sympathetic and parasympathetic nerve pathways
- A.40. you distinguishes between cranial nerves and spinal nerves
- A.41. you summarizes the structure and functions of the various meninges
- A.42. you explain how a three-neuron reflex arc can be anatomically modified to create a crossed extensor reflex and a nerve circuit that involves the brain
- A.43. you summarize cerebrospinal fluid
- A.44. you examine the purpose of a spinal tap, where a spinal tap is performed, and why it is performed where it is
- A.45. you summarize possible causes and effects of the disorder known as hydrocephalus

Unit 9. Muscular System

A. Relate the major gross and microscopic anatomical components of the muscular system to their functions

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam
- A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- A.1. you summarize the functions of the muscular system
- A.2. you summarize the term motor unit
- A.3. you explain what is meant by the all-or-none response of a motor unit
- A.4. you relate the size and number of motor units in a whole skeletal muscle to the precision with which that whole skeletal muscle can be controlled
- A.5. you summarize different types of skeletal muscle contractions
- A.6. you distinguish between the three basic types of muscle tissue with respect to their structural characteristics, functional characteristics, and innervation
- A.7. you examine a sarcomere unit as seen using a light microscope
- A.8. you examine a sarcomere unit as seen using an electron microscope
- A.9. you summarize how both the striation pattern and the filament arrangement of a sarcomere unit change as that sarcomere unit contracts
- A.10. you summarize in detail the anatomy of a non-contracting skeletal muscle cell
- A.11. you summarize in an orderly fashion the process by which a relaxed skeletal muscle cell contracts
- A.12. you summarize in an orderly fashion the process by which a contracted skeletal muscle cell relaxes
- A.13. you identify the major skeletal muscles of the human body
- A.14. you demonstrate origins and insertions of the major skeletal muscles on a human skeleton
- A.15. you demonstrate the actions of the major skeletal muscles of the human body

Unit 10. Somatic & Special Senses

A. Relate the major gross and microscopic anatomical components of the somatic and special senses to their functions

Linked Core Abilities

Communication
Critical thinking
Science and Technology

Competence will be demonstrated:

- A.1. in the evaluation of written answers to study questions
- A.2. in the evaluation of a multiple choice exam
- A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

- A.1. you distinguish between types of receptors based on location stating how they are different
- A.2. you distinguish between types of receptors based on sensitivity stating the type of stimulus each is most sensitive to
- A.3. you summarize different levels of anatomical complexity that receptors may have giving specific examples of each
- A.4. you examine the different tastes involved in the gustatory sense stating what kind of chemical substance is being detected by each
- A.5. you contrast the senses of smell with the sense of taste

- A.6. you contrast general and special senses
- A.7. you identify the parts of the eye and the extrinsic eye muscles
- A.8. you summarize the term refraction as it relates to the eye, explaining what eye structures are involved in refraction and why refraction is necessary
- A.9. you examine how the ciliary muscles function to allow the eye to adjust the degree of refraction for objects that are at different distances away from the eye
- A.10. you examine the arrangement of the muscle layers of the iris and how these layers act to adjust the amount of light entering the eye
- A.11. you examine how light initiates nerve impulses in rods and cones
- A.12. you contrast rods and cones
- A.13. you identify the parts of the ear
- A.14. you contrasts sensory hearing loss with conductive hearing loss
- A.15. you examine the roles of the different parts of the ear in the process of hearing
- A.16. you contrast the functions of the vestibule and the semicircular canals with respect to balance and equilibrium

Unit 11. Endocrine System

A. Relate the major gross and microscopic anatomical components of the endocrine system to their functions

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

Criteria - Performance will be satisfactory when:

A.1. you summarize the functions of the endocrine system

A.2. you distinguish between message transmission via the endocrine system and message transmission via the nervous system with respect to form, pathway, speed, and duration of effect

A.3. you summarize the terms endocrine gland and hormone

A.4. you summarize general characteristics of how hormones function

A.5. you compare and contrast hormones that bind to membrane receptors with hormones that bind to intracellular receptors

A.6. you explain why the pituitary gland has long been known as the master gland of the endocrine system

A.7. you summarize the pituitary gland hormones and their target organs

A.8. you explain why hypothalamus could also be called the master gland of the endocrine system

A.9. you summarize the hypothalamus hormones and their target organs

A.10. you explains how the blood level of growth hormone is regulated

A.11. you examines glands other than pituitary and hypothalamus which have known endocrine functions

A.12. you explains how the blood level of cortisol is regulated

A.13. you summarizes processes that can supply sugar to the blood

A.14. you relates the process of dephosphorylation to the fact that glycogen stored in the liver can function as a source of blood sugar whereas glycogen stored in skeletal

muscle cells cannot

A.15. you summarize the production site, target organs, and effects on blood sugar level of glucagon, cortisol, growth hormone, and adrenalin

A.16. you summarize processes that can remove sugar from the blood

A.17. you examine the production site for insulin explaining how it acts to lower blood sugar level

A.18. you explain the significance of glucose sparing

A.19. you summarize symptoms of diabetes mellitus

A.20. you identify methods of treatment for the different types of diabetes mellitus

Unit 12. Cardiovascular System - Blood

A. Relate the major gross and microscopic anatomical components of the blood to their functions

Linked Core Abilities

Communication

Critical thinking

Science and Technology

Competence will be demonstrated:

A.1. in the evaluation of written answers to study questions

A.2. in the evaluation of a multiple choice exam

A.3. in the evaluation of a lab practical exam

Criteria - Performance will be satisfactory when:

A.1. you examine the composition of the fluid matrix of the blood

A.2. you summarize the formed elements of the blood

A.3. you examine erythrocytes in terms of anatomy, motility, total number, formation site, life span, and functions

A.4. you examine leucocytes in terms of anatomy, motility, total number, formation site, life span, and functions

A.5. you summarize the two broad categories of leucocytes and the primary formation sites for each

A.6. you summarize the individual types of leucocytes stating the major functions of each type

A.7. you summarize normal blood values for both men and women with respect to rbc count, wbc count, hemoglobin, hematocrit, mean cell volume, and differential count

A.8. you examine different types of anemia stating a specific cause for each

A.9. you examine the different ABO blood types and the antigens and antibodies characteristic of each

A.10. you explain if a transfusion reaction would be expected for the different possible combinations of ABO blood type donors and recipients

A.11. you identify the ABO blood type indicated by antigen/antibody reactions on blood typing plates

A.12. you summarize the term Rh factor relating the presence or absence of this factor to the different Rh blood types

A.13. you identify the Rh blood type indicated by antigen/antibody reactions on blood typing plates

A.14. you summarize the specific combination(s) of maternal and fetal Rh blood types that could cause problems in pregnancy

A.15. you summarize the problems that could occur in pregnancy when specific

combination(s) of maternal and fetal Rh blood types are present

A.16. you summarize the basic mechanisms of hemostasis

A.17. you summarize the major steps in the clotting cascade describing the major events of each stage

A.18. you examine platelets in terms of anatomy, motility, total number, formation site, life span, and functions

A.19. you summarize the different platelet factors describing how each acts to minimize bleeding

A.20. you summarize the terms anemia, polycythemia, leucocytosis, leucopenia, and thrombocytopenia

A.21. you explain how factors that can prolong bleeding time work

A.22. you contrast the function of streptokinase or urokinase with tissues plasminogen activator

A.23. you summarize factors that can increase the risk of intravascular clotting

A.24. you distinguish between the terms thrombus and embolus

A.25. you summarize the terms thrombosis and phlebitis

A.26. you summarize the diagnostic value of the PT test and the PTT test

A.27. you differentiate between normal and abnormal blood on a blood smear