



Anatomy and Physiology

The Anatomy/Physiology objectives that follow are meant as a framework for Career and Technology Centers and educators. They should aid in alignment of curriculum; provide lesson and lab development, supply supplemental resources, and assist in the assignment of high school anatomy/physiology lab science academic credit. Oklahoma *Priority Academic Student Skills (PASS)* and National Science Education Standards were used in the development of this standard in order for it to provide rigor and relevance in content and process skills for the students.

Course Description

Anatomy/Physiology is the study of the structural complexity of the human body and its intricate functional mechanisms. This course is taught as a laboratory science. Students will conduct scientific investigations and fieldwork using scientific knowledge and methodology that will enable them to make educated conclusions based on higher-level critical thinking and problem solving skills. The areas studied will be an integration of biology and chemistry and will include, but are not limited to: Organization of the body, Chemical Basis for Life, Cells & Tissues, Integumentary System, Skeletal system, Muscular system, Nervous system, Endocrine system, Blood, Circulatory system, Lymphatic & Immune systems, Respiratory systems, Digestive system & Metabolism, Urinary system, and Reproductive system. An emphasis should be placed on real-world applications and active-learning exercises should be included along with laboratory experiences.

Requirements for College Admission Status (Title 70 O.S. § 11-103.6)

These courses are to be taught by a highly qualified teacher with an Oklahoma Biology teaching certification or Anatomy/Physiology certification. The students should be in the eleventh or twelfth grade or if a sophomore, they should be in a Focused Field of Career Study program. The prerequisite for this course is Biology I with Chemistry being highly recommended. The course should consist of 40% laboratory or fieldwork in order to be considered a lab science. The course will have at a minimum, but may exceed, a duration of 120 hours within a school year (72 hours theory/48 lab hours).



Anatomy and Physiology

Syllabus

Objectives	National Science Education Standards 9-12 Content Standards	Oklahoma PASS Process Standards
I. Organization of the Body		
A. Define and explain how anatomy and physiology are related.	C, G	
B. Name and explain the relationship between levels of structural organization that make up the human body.	A, C	
C. Identify and state the major functions of the organ systems of the body.	A, C	
D. Properly use the terms that describe relative positions, body sections, and body regions.	A, C	
E. Describe the functions of the human body and explain how these functions aid in the maintenance of life.	A, B, C, F, G	
F. Develop an understanding of homeostasis and its role in normal body function.	A, B, C, F, G	
I-Activities/Labs-Organization of the Body		
a. Observe, measure, and describe the anatomical body directions, regions, and planes.	A, B, C	1.1, 1.2, 1.3, 2.2, 4.2, 4.5, 4.8, 5.1
b. Interpret a biological model	A, C	5.1, 6.4
c. Analyze and formulate treatments and outcomes from real-world case studies	A, B, C, F, G	4.1, 4.7, 5.1, 6.1, 6.4
Suggested Labs and Activities		
<i>Zoologik System of Human Anatomy in Clay: Lesson A-Directional Terminology</i>	A, B, C	4.2,4.5, 4.8, 5.1,
<i>Revealed software</i>	A, C	5.1, 6.4
<i>MAVCC-Anatomy and Physiology Module Set I-Module 1: Assignment 1</i>	A, B, C, F, G	4.1, 4.7, 5.1, 6.1, 6.4
II. Chemical Basis for Life		

A. Explain how the study of living materials requires understanding of chemistry.	A, B, C	
B. Describe the relationships among matter, atoms, and molecules.	B, C	
C. Identify three major types of chemical reactions that occur in the body	B, C	
D. Differentiate between a salt, an acid, and a base	B, C	
E. Describe factors that affect chemical reaction rates	B, C	
F. Compare the processes of osmosis, diffusion, filtration and give examples of their uses in the body	A, B, C	
G. Explain the concept of pH, and its affect on body functions	B, C	
H. Explain the importance of water and salts to body homeostasis	B, C	
I. Distinguish between organic and inorganic compounds	B, C	
J. Compare the structures and functions of carbohydrates, lipids, proteins, and nucleic acids	B, C	
K. Distinguish between different types of proteins	B, C	
L. Describe how and where enzymes work in the body	B, C	
M. Compare and contrast the structure and functions of DNA and RNA	A, B, C	
N. Explain the role of ATP in cell metabolism	B, C	
II-Activities/Labs-Chemical Basis for Life		
a. Investigations with enzymes that illustrate criteria for their proper function	A, B, C, E	1.2,1.3,3.1,3.2,4.2,4.4,4.5, 4.6,4.7,4.8,6.1,6.2,6.3,6.4
b. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
c. Build a model of DNA	A, B, C	5.1, 5.3
d. Inquiry activities that investigate pH range	A, B, C, E	6.1, 6.2, 6.3, 6.4
Suggested Activities & Labs		
<i>Anatomy & Physiology Coloring Workbook-Chapter 2</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module</i>	A, B, C, F,	1.1, 1.3, 2.1, 2.2, 4.1, 4.2,

Set I-Module 2: Assignment 1	G	4.3,4.4, 4.5, 4.8
III. Cells and Tissues		
A. Identify on a cell model or diagram the cell organelles and be able to explain their functions	C	
B. Describe the structure of the plasma membrane, and explain how the various transport processes account for the directional movements of specific substances across the plasma membrane	A, B, C	
C. Describe different cell types and explain the functionality of the differences	C	
D. Describe the cell cycle, including the phases of mitosis and explain how the timing of cell division is regulated.	C	
E. Have an understanding of stem cells and how they are used in modern medical procedures and research	C, E, F, G	
F. Name the four primary classes of human tissues and explain how they differ structurally and functionally	C	
G. Know the anatomical location of the different tissue types	C	
H. Describe ways the body repairs damaged tissue	C	
I. Identify the various forms of cancer and describe how it affects the body	C, E, F, G	
III. Activities/Labs-Cells and Tissues		
a. Osmosis and diffusion investigations	A, B, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
b. Microscope labs with either prepared or student-made cell and tissue slides	A, C, E	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
c. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
d. Multimedia that enables students to visualize what occurs in the body microscopically	C, E, F, G	5.1, 5.3
Suggested Activities & Labs		
<i>Anatomy & Physiology Coloring Workbook-Chapter 3</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set 1-Module 4: Assignment 1</i>	A, B, C, F, G	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
Viewing and study guide of <i>Osmosis Jones</i>	C, E, F, G	5.1, 5.3

IV. Integumentary System		
A. Have an understanding of the functions of the skin and be able to relate them to its structure	B, C	
B. Recognize and identify the major skin structures when provided a diagram or model	C	
C. Identify and know the purpose of the accessory structures of the skin	C, F	
D. Describe the normal and pathological colors that the skin can have and explain their causes	C, F, G	
E. Identify and differentiate between the three types of skin cancer	C, F, G	
F. Describe the three classes of burns and the priorities in burn treatment	C, F	
G. Understand the role of the Integumentary System in maintaining homeostasis	B, C	
IV. Activities/Labs-Integumentary System		
a. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
b. Multimedia that enables students to visualize what occurs physiologically	C, E, F, G	5.1, 5.3
c. Microscope lab that enables the student to observe either prepared or fresh skin cells	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
Suggested Activities & Labs		
<i>Anatomy & Physiology Coloring Workbook- Chapter 4-Skin and Body Membranes</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set II-Module 1: Assignment 1 & 2</i>	A, B, C, F, G	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
V. Skeletal System		
A. Identify the subdivisions of the skeleton as axial or appendicular	C	
B. State several functions of the skeletal system	C	

C. Demonstrate knowledge, with the use of models or pictures, the major bones, their surface features, and basic functions	C, E, F	
D. Describe the developmental aspects of the skeleton from formation in the fetus throughout the lifetime of the bones	C, F, G	
E. Distinguish between and give the function of the four major classes of joints	C	
F. Be able to identify and understand the function of tendons and ligaments	C	
G. Understand the causes and current medical treatments of skeletal disorders and abnormalities	C, E, F, G	
V. Activities/Labs-Skeletal System		
a. Classification of joints according to their shape and function	C	2.1, 2.2
b. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
c. Multimedia that enables students to visualize what occurs physiologically	C, E, F, G	5.1, 5.3
Suggested Activities & Labs		
<i>Zoologik System of Human Anatomy in Clay: Lesson B-Them Bones!</i>	B, C	2.1, 5.1 5.3
<i>Anatomy & Physiology Coloring Workbook-Chapter 5-The Skeletal System</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>Anatomy & Physiology Revealed software-Volume 1</i>	A, C	5.1, 6.4
<i>MAVCC-Anatomy and Physiology Module Set II-Module 2: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
VI. Muscular System		
A. Distinguish between the three types of muscles, and tell where they are located in the body	A, C	
B. Describe the structure of a skeletal muscle with respect to location and names of its connective tissue coverings and attachments	A, C	
C. Describe the microscopic structure and functional role of the skeletal muscle fiber	A, C	
D. Explain how muscle fibers are stimulated to contract and what occurs during a muscle twitch with regard to each component's function	A, B, C	

E. Explain how skeletal muscle fibers are innervated and how they contract	C	
F. Explain how skeletal muscle meets its energy demands during rest and exercise	A, B, C	
G. Explain oxygen debt and muscle fatigue and discuss situations that would cause them	A, B, C	
H. Describe the effects of aerobic and resistance exercise on skeletal muscles and other body organs	A, B, C	
I. List and define the criteria used in naming muscles and be able to provide an example to illustrate the use of each criterion	C	
J. Name and identify, on a diagram or model, each of the muscles. State the origin and insertion for each, and describe the action of each.	C	
VI. Activities/Labs-Muscular System		
a. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
b. Labs that demonstrate muscle fatigue	A, C, F	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
c. Labs that model the mechanical advantage of certain muscle groups	A, B, C, F	1.1, 1.2, 1.3 3.1, 3.2, 3.3, 3.4, 3.5
d. Microscope lab that enables the student to observe either prepared or fresh muscle tissue	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
e. Multimedia that enables students to visualize the action of muscles from within the body	C, E, F, G	5.1, 5.3
Suggested Activities & Labs		
<i>Zoologik System of Human Anatomy in Clay: Lessons C-F-Muscle Concepts-Muscle Building</i>	A, C, E	1.3, 5.1, 5.3
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 11, Activities 1,2, & 7</i>	A, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
<i>Anatomy & Physiology Coloring Workbook-Chapter 6-The Muscular System</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>Anatomy & Physiology Revealed software-Volume 1</i>	A, C	5.1, 6.4
<i>MAVCC-Anatomy and Physiology Module Set II-Module 3: Assignment 1 & 2</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3

VII. Nervous System		
A. List the general functions of the nervous system	C	
B. Explain the structural and functional divisions of the nervous system	C	
C. List the types of supporting cells and cite their functions	C	
D. Describe the important anatomical regions of a neuron and relate each to a physiological role	A, C	
E. Classify sensory receptors according to body location, structure, and stimulus detected	A, C	
F. Describe the events that lead up to, happen during, and result after a nerve impulse and its conduction from one neuron to another	A, C, F	
G. Identify and indicate the functions of the major regions of the cerebral hemispheres, diencephalons, brain stem, and cerebellum on a human brain model or diagram	C	
H. Identify the three meningeal layers, and state their functions	C	
I. Understand the formation and function of cerebrospinal fluid and the blood-brain barrier	C	
J. Describe spinal cord structure and list its functions	C	
K. List the components of the peripheral nervous system	C	
L. Distinguish between sensory, motor, and mixed nerves	C	
M. Name the 12 pairs of cranial nerves and describe the body region and structures innervated by each	C	
N. Name the four major nerve plexuses, give the major nerves of each, and describe their distribution	A, C	
O. Distinguish between autonomic and somatic reflexes	C	
P. Compare and contrast the general functions of the parasympathetic and sympathetic divisions	A C	

Q. Understand from an anatomical and physiological perspective, the functions of sight, hearing & balance, taste, and smell	A, C, F	
R. Describe the developmental aspects of the nervous system, from embryo to old age	A, C	
VII. Activities/Labs-Nervous System		
a. Modeling of the human nervous system, either made by the student or prepared	A, C	3.5, 5.1, 5.3
b. Observation/dissection of preserved animal central nervous systems and/or special sense organs	A, C, F	3.5, 4.1, 4.2, 6.2
c. Labs demonstrating human reflex	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
d. Multimedia that enables students to visualize what occurs physiologically with the nervous system	C, E, F, G	5.1, 5.3
e. Microscopically observing different parts of the special sense organs	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
f. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
Suggested Activities & Labs		
<i>Zoologik System of Human Anatomy in Clay: Lesson G-Nervous System</i>	A, C	3.5, 5.1, 5.3
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 16-Human Reflex Physiology & Exercise 17-Activities 1-15</i>	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
<i>Anatomy & Physiology Revealed software-Volume 2</i>	A, C	5.1, 5.3
<i>Anatomy & Physiology Coloring Workbook-Chapter 7-The Nervous System & Chapter 8-Special Senses</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set II-Module 4: Assignment 1, Module 6: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
VIII. Endocrine System		
A. Indicate important differences between hormonal and neural controls of body functioning	A, C	
B. List the major endocrine organs, and describe their locations in the body and the hormones they secrete	C	

C. Describe what a hormone is and how it functions	C	
D. Understand the negative feedback mechanism and describe its role in regulating blood levels of the various hormones	A, B, C	
E. Describe major pathological consequences of hypersecretion and hyposecretion of the hormones	A, B, C	
F. Identify the endocrine role of the kidneys, the stomach and intestine, the heart, and the placenta	C	
E. Describe the effect of aging on the endocrine system and body homeostasis	A, C, F, G	
VIII. Activities/Labs-Endocrine System		
a. Multimedia that enables students to visualize what occurs physiologically with the endocrine system	C, E, F, G	5.1, 5.3
b. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
c. Microscopically observing different types of cells in different endocrine glands	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
Suggested Activities & Labs		
<i>Anatomy & Physiology Coloring Workbook-Chapter 9-The Endocrine System</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
<i>Anatomy & Physiology Revealed software-Volume 4</i>	A, C	5.1, 5.3
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 18-Activities 1-5</i>	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
<i>MAVCC-Anatomy and Physiology Module Set II-Module 5: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
IX. Blood		
A. Describe the composition and physical characteristics of whole blood and explain why it is classified as a connective tissue	B, C	
B. List the functions of blood	C	
C. Discuss the composition and functions of plasma	C	
D. Describe the blood-clotting process	B, C	

E. Describe the ABO and Rh blood groups and explain the basis of transfusion reactions	B, C, E	
F. Explain the importance of blood testing as a diagnostic tool	C, E	
G. Name some blood disorders that become more common with age	C, F, G	
IX. Activities/Labs-Blood		
a. Examining the formed elements of blood microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
b. Mathematical computation activity in which the ratio of components in human blood is found	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
c. Hematologic Tests-Hematocrit, hemoglobin determination, coagulation time, blood typing	A, B, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
d. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
e. Multimedia that enables the student to visualize what is occurring physiologically	C, E, F, G	5.1, 5.3
IX. Suggested Activities & Labs		
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 19-Activities 1-6</i>	A, B, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
<i>Anatomy & Physiology Coloring Workbook-Chapter 10-Blood</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set II-Module 7: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
X. Cardiovascular System		
A. Describe the location of the heart in the body, and identify its major anatomical areas on a model or diagram	C	
B. Name the coverings of the heart	C	
C. Describe the structure and functions of the four heart chambers. Name each chamber and provide the name and general route of its associated great vessels	C	
D. Identify the elements of the intrinsic conduction system of the heart, and describe the pathway of impulses through this system	B, C	

E. Explain what information can be gained from an electrocardiogram	A, C	
F. Compare and contrast the structure and function of arteries, veins, and capillaries	A, C	
G. Define vasoconstriction and vasodilation	C	
H. Identify the body's major arteries and veins, and name the body region supplied by each	C	
I. Discuss the unique features of special circulations of the body: arterial to the brain, hepatic portal, pulmonary, and fetal	A, C	
J. List and explain the factors that influence blood pressure and describe how blood pressure is regulated	A, B, C	
K. Describe the structure and function of a capillary bed	A, C	
L. Describe the fetal circulatory system	C, F	
X. Activities/Labs-Cardiovascular		
a. Draw a diagram of a normal electrocardiogram tracing: name the individual waves and intervals, and indicate what each represents. Name some abnormalities that can be detected on an ECG tracing	A, C	4.7, 5.1, 5.2, 5.3
b. Examining blood vessel and cardiac muscle slides microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
c. Modeling of the human circulatory system	A, C	5.1, 5.2, 5.3
d. Investigations of pulse, heart sounds, and blood pressures	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
e. Observation/dissection of preserved animal heart	A, C, F	3.5, 4.1, 4.2, 6.2
f. Multimedia that enables the student to visualize what is occurring physiologically	A, C, E, F, G	5.1, 5.3
g. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3

Suggested Activities & Labs		
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 20-Activities 1-3, Exercise 21-Activities 1-7, Exercise 22-Activities 1-6</i>	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
<i>Anatomy & Physiology Coloring Workbook-Chapter 11-The Cardiovascular System</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
<i>Anatomy & Physiology Revealed software-Volume 3</i>	A, C	5.1, 5.2, 5.3
<i>Zoologik System of Human Anatomy in Clay: Lesson H-Cardiovascular System: The Beat Goes On...</i>	A, C	5.1, 5.2, 5.3
<i>MAVCC-Anatomy and Physiology Module Set II-Module 8: Assignment 1, Module 9: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
XI. Lymphatic System and Immune Systems		
A. Name the two major types of structures composing the lymphatic system and explain how the lymphatic system is functionally related to the cardiovascular and immune systems	A, C, F	
B. Describe the composition of lymph and explain its formation and transport	C	
C. Describe the general location, histological structure, and functions of lymph nodes	A, C	
D. Name and describe the other lymphoid organs of the body. Compare and contrast them with lymph nodes structurally and functionally	A, C	
E. Describe the surface membrane barriers and their protective functions	B, C	
F. Explain the importance of phagocytosis and natural killer cells in nonspecific body defense	A, C	
G. Relate the events of the inflammatory process.	A, C	
H. Name several antimicrobial substances produced by the body that act in nonspecific body defense	A, C, F	
I. Explain how fever helps protect the body against invading pathogens	A, C, F	
J. Explain what an antigen and hapten is and name that act as complete antigens	C	

K. Compare and contrast the origin, maturation process, and general function of B and T lymphocytes. Describe the role of macrophages and other phagocytes in immunity	A, C, F	
L. Describe immunodeficiencies, allergies, and autoimmune diseases	C, F, G	
XI. Activities/Labs-Lymphatic & Immune		
a. Multimedia that enabling the student to visualize the physiology of the lymphatic system	A, C, E, F, G	5.1, 5.3
b. Creating a model of the human lymphatic system	A, C	5.1, 5.2, 5.3
c. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
Suggested Activities & Labs		
<i>Anatomy & Physiology Revealed</i> software-Volume 3	A, C	5.1, 5.2, 5.3
<i>Zoologik System of Human Anatomy in Clay: Lesson I-Lymph System</i>	A, C	5.1, 5.2, 5.3
<i>Anatomy & Physiology Coloring Workbook-Chapter 12-The Lymphatic System and Body Defenses</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set I-Module 3, Assignment 1 & Module Set II-Module 10: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
XII. Respiratory System		
A. Identify the organs forming the respiratory passage-way in descending order until the alveoli are reached	C	
B. Describe several protective mechanisms of the respiratory system	A, C	
C. Describe the makeup of the respiratory membrane and relate its structure to its function	A, C	
D. Describe the structure and function of the lungs and the pleural coverings	C	
E. Explain the relative roles of the respiratory muscles and lung elasticity in effecting volume changes that cause air to flow into and out of the lungs	A, B, C	

F. Explain the functional importance of the partial vacuum that exists in the intrapleural space	B, C	
G. Describe several physical factors that influence pulmonary ventilation	C	
H. Explain and compare the various lung volumes and capacities. Indicate types of information that can be gained from pulmonary function tests	A, B, C	
I. Describe how oxygen and carbon dioxide are transported in the blood	C	
J. Describe the neural controls of respiration	C	
K. Name several physical factors that influence respiratory rate	A, C	
L. Describe the symptoms and probable causes of Chronic Obstructive Pulmonary Disease and lung cancer	C, F, G	
M. Describe normal changes that occur in respiratory system functioning from infancy to old age	C, F	
XII. Activities/Labs-Respiratory System		
a. Measure volumes and capacities of lungs with either a commercial or homemade spirometer	A, B, C, E	1.1, 1.2, 1.3, 2.1, 3.5, 6.1, 6.2, 6.3, 6.4
b. Measuring respiratory rate	A, C, E	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
c. Examining prepared slides of trachea and lung tissue microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
d. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
e. Multimedia enabling the student to visualize the physiology of the respiratory system	A, C, E, F, G	5.1, 5.3
Suggested Activities & Labs		
<i>Anatomy & Physiology Revealed</i> software-Volume 3	A, C, E, F, G	5.1, 5.3
<i>Anatomy & Physiology Coloring Workbook</i> -Chapter 13-The Respiratory System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Spirometer Lab	A, B, C, E	1.1, 1.2, 1.3, 2.1, 3.5, 6.1, 6.2, 6.3, 6.4
<i>MAVCC-Anatomy and Physiology Module Set II</i> -Module 11: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3

XIII. Digestive System and Metabolism		
A. Describe the overall function of the digestive system and differentiate between organs of the alimentary canal and accessory digestive organs	A, C	
B. List and briefly describe the major processes occurring during digestive system activity	C	
C. Explain how villi aid digestive processes in the small intestine	B, C	
D. Describe the anatomy and basic function of each organ and accessory organ of the alimentary canal	C	
E. Name the deciduous and permanent teeth and describe the basic anatomy of a tooth	C	
F. Describe the composition and functions of saliva and explain how salivation is regulated	C	
G. Describe the mechanism of chewing and swallowing	C	
H. Explain how gastric secretion and motility in the stomach are regulated	C	
I. Describe the function of local hormones in the digestive process	C	
J. State the roles and tell how bile and pancreatic juice are regulated in the small intestine	B, C	
K. List the major functions of the large intestine and describe the regulation of defecation	C	
L. List the major enzymes or enzyme groups produced by the digestive organs or accessory glands and name the foodstuffs on which they act and the end products of protein, fat, carbohydrate, and nucleic acid digestion	B, C	
M. List the six major nutrient categories and note important dietary sources and the main cellular uses of each	B, C	
N. Define metabolism and explain the difference between catabolism and anabolism	C	

O. Analyze and explain the chemical reactions that provide energy for the body. Identify the means, including the structure and function of the digestive system by which energy is processed and stored within the body	A, B, C	
P. Explain the importance of energy balance in the body and indicate consequences of energy imbalance	B, C	
Q. Define basal metabolic rate and total metabolic rate and name several factors that influence each	B, C	
R. Describe how body temperature is regulated and indicate the common mechanisms regulating heat production/retention and heat loss from the body	B, C	
S. Analyze the effects of energy deficiencies in malabsorption disorders and name important congenital disorders of the digestive system and significant inborn errors of metabolism	A, B, C, F	
XIII. Activities/Labs-Digestive & Metabolism		
a. Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
b. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
c. Observations/dissections of preserved digestive system specimens	A, C, F	3.5, 4.1, 4.2, 6.2
d. Examining parts of the digestive system microscopically using prepared slides	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
e. Experimentation in which the process and products are found when protein, carbohydrates, and lipids are broken down	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
f. Observation and classification of movements and sounds of digestion	A, C	1.1, 2.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8
g. Mathematically calculate basal metabolic rate	A, C, E	3.3, 5.1, 5.3

Suggested Activities & Labs		
<i>Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 25-Activities 1-12</i>	A, C, E, F, G	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 5.1, 5.3
<i>Anatomy & Physiology Revealed software-Volume 4</i>	A, C, E, F, G	5.1, 5.3
<i>Anatomy & Physiology Coloring Workbook-Chapter 14-The Digestive System and Body Metabolism</i>	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set II-Module 12: Assignment 1</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
XIV. Urinary System		
A. Describe the anatomy of the kidney and its coverings	C	
B. Trace the blood supply through the kidney	C	
C. Identify the parts of the nephron responsible for filtration, reabsorption, and secretion and describe the mechanisms underlying each of these functional processes	A, B, C	
D. Describe the normal physical and chemical properties of urine	B, C	
E. List several abnormal urine components and name the condition when each is present in detectable amounts	A, B, C, E	
F. Describe the general structure and function of the ureters, bladder, and urethra	C	
G. Compare the course, length, and functions of the male urethra with those of the female	C	
H. Define micturition and describe the micturition reflex	C	
I. List the factors that determine body water content and describe the effect of each factor	B, C, E	
J. Compare and contrast the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid-base balance of the blood	B, C	
K. Describe some congenital problems and explain the effect of aging of the urinary system	C, E, F	

XIV. Activities/Labs-Urinary System		
a. Observation/dissection of preserved specimen	A, C, F	3.5, 4.1, 4.2, 6.2
b. Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
c. Examining the nephron microscopically via prepared slides	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
d. Creating a model of the human urinary tract with an understanding of the function of all its components	A, C	5.1, 5.3
e. Conduct urinalysis testing on known and unknown samples of urine	A, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
f. Conduct dialysis testing	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
g. Perform glucose analysis on urine	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
h. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Suggested Activities & Labs		
<i>Anatomy & Physiology Revealed</i> software-Volume 4	A, C, E, F, G	5.1, 5.3
<i>Anatomy & Physiology Coloring Workbook</i> -Chapter 15-The Urinary System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
<i>Essentials of Human Anatomy & Physiology Laboratory Manual</i> : Exercise 26-Activities 1-3	A, B, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
<i>Zoologik System of Human Anatomy in Clay</i> : Lesson J-Urinary System	A, C, E	5.1, 5.3
<i>MAVCC-Anatomy and Physiology Module Set II</i> -Module 13: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
XV. Reproductive System		
A. Describe the common function of the male and female reproductive systems	C	
B. Using a model or diagram, identify the organs and accessory organs of the male and female reproductive systems and discuss the general function of each	C	
C. Know the process of meiosis to the extent of comparing and contrasting it to mitosis	B, C	
D. Outline the process of spermatogenesis	C	

E. Discuss hormonal regulation of testicular function and the physiological effects of testosterone on male reproductive anatomy	B, C	
F. Trace the pathway of sperm cells from their site of formation to the body exterior	C	
G. Describe the phases of the ovarian cycle and relate them to events of oogenesis	C	
H. Describe how hormones control the activities of female reproductive organs and the development of female secondary sex characteristics	B, C	
I. Discuss the structure and function of the mammary glands	C	
J. Describe the process of fertilization and the changes of the female body during pregnancy	C	
K. Understand the major functions of the placenta	C	
L. Explain how labor is initiated and describe the three stages of labor	C	
M. Describe the stages of human embryology and gestation including investigation of gestational and congenital disorders	C, E, F	
M. Discuss several agents that can interfere with normal fetal development	C, E, F	
N. Distinguish among the modes of inheritance and describe the events that lead to genetic variability of gametes	C, E	
O. List and explain several techniques used to determine or predict genetic diseases	C, E	
XV. Activities/Labs-Reproductive System		
a. Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
b. Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
c. Microscopic examination of prepared slides of sperm cells and ovarian tissue	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5

Suggested Activities & Labs		
<i>Anatomy & Physiology Revealed</i> software- Volume 4	A, C, E, F, G	5.1, 5.3
<i>Essentials of Human Anatomy & Physiology Laboratory Manual:</i> Exercise 27-Activities 1-4	A, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
<i>Anatomy & Physiology Coloring Workbook-</i> Chapter 16-The Reproductive System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
<i>MAVCC-Anatomy and Physiology Module Set II-Module 14: Assignment 1 & Module 15: Assignment 1 Parts A & B</i>	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3

Reference and Resources

Referenced Standards

National Science Standards (5th ed). (1998). National Research Council, Washington, D.C., National Academy of Sciences

Oklahoma Priority Academic Student Skills (2003). Oklahoma State Department of Education-PASS- { www.sde.state.ok.us }

Suggested Texts

Marieb, Elaine N. (2006). *Essentials of Human Anatomy & Physiology* (8th ed.). San Francisco, CA: Benjamin Cummings.

Martini, Frederic H. (2006). *Fundamentals of Anatomy & Physiology* (7th ed.). San Francisco, CA: Pearson Education, Inc

Saladin, Kenneth S. (2007). *Anatomy and Physiology: The Unity of Form and Function* (4th ed.). New York, NY: McGraw-Hill.

Shier, David, Butler, Jackie, & Lewis, Ricki.(2006). *Hole's Essentials of Human Anatomy and Physiology* (9th ed.). New York, NY: McGraw-Hill Higher Education

Supplemental Materials

Marieb, Elaine N. (2006). *Anatomy & Physiology Coloring Workbook* (8th ed.). San Francisco, CA: Benjamin Cummings.

Marieb, Elaine N. (2006). *Anatomy & Physiology Laboratory Manual* (3rd ed.). San Francisco, CA: Benjamin Cummings.

Marieb, Elaine N. (2006). *Instructor's Manual*. San Francisco, CA: Benjamin Cummings.

Hilley, Robert (2001). *Surgical Technology-Anatomy & Physiology* (Modules 1 & 2). Stillwater, OK: Multistate Academic and Vocational Curriculum Consortium, Inc.

Anatomy & Physiology Revealed [Computer software]. McGraw-Hill Higher Education. www.aprevealed.com

Ewan, Starla A. (2001). *Starla On Maniken-A Curriculum Teacher's Guide*. Zahourek Systems, Inc.

Farrelly, Bobby, Farrelly, Peter, Fisher, Marc S., Frank, Billy, Penny, Aaron, & Penn, Zac (Producers), & Hyman, Marc (Writer). (2001). *Osmosis Jones* [Motion Picture]. United States: Warner Bros. Pictures

Internet Sources

Howard Hughes Medical Institute—{hhmi.org/biointeractive/}

Department of Health and Human Services-Centers for Disease Control and Prevention—{cdc.gov}

Public Broadcast System-NOVA-{www.pbs.org/wgbh/nova/heart/heartmap.html}

Science Museum of Minnesota-{www.anatomyatlases.org}

Web Resources covering several Anatomy/Physiology Course Topics-
{www.cbu.edu/~aross/APIhome.hrm#web}

University of Utah-has research of DNA, genetics disorder library, genetics of addiction, etc. {<http://learn.genetics.utah.edu/>}

Access Excellence-collections of websites and activities specifically for Health and Bioscience teachers {<http://www.accessexcellence.org/>}

A bank of digital resources-{<http://biodidac.bio.uottawa.ca/>}

Current Science and Technology-podcasts, iTunes, video of latest science news articles-
{<http://www.mos.org/cst/category/updates/healthbio/>}

Dartmouth Medical School-wonderful videos and images-
{<http://www.dartmouth.edu/~anatomy/index.html>}

Science Museum of National Academy of Sciences-web activities with DNA, inherited diseases, DNA & criminal justice, etc.-
{<http://www.koshlandscience.org/exhibitdna/index.jsp>}

Life Sciences World-Online resource for news about biotech, pharmaceutical, medical, or life science industries-{<http://www.lifesciencesworld.com/>}

Video clips of heart valves at work as well as medical devices placed in the heart-
{<http://visibleheart.com/videoclips.html>}

Yale Medical School-many views of the heart, all labeled-
{<http://info.med.yale.edu/intmed/cardio/imaging/>}

The Whole Brain Atlas-images of the brain normal and after many different diseases-
{<http://www.med.Harvard.edu/AANLIB/home.html>}

