Choosing between personalized learning and instructional freedom? Easily get both with CogBooks™ Courseware

CogBooks™ Courseware is a ready-to-adopt, complete course solution that delivers comprehensive instructional content, homework and assessment within a continuously adaptive learning environment.

CogBooks Courseware is ideal for active learning or flipped classroom models in online, hybrid or campus-based modalities. One of the primary features of CogBooks adaptive learning technology is agility. Unlike other adaptive learning courseware, CogBooks Courseware enables more freedom and control for instructors when it comes to making it your own, and students benefit from an individualized path towards concept mastery and course success.

CogBooks Courseware users experience...

- Positive learning and course outcomes with high user satisfaction
- High-quality content including open educational resources, videos, interactive simulation activities and assessments
- Seamless and secure integration with any learning management system
- Compliance with WCAG 2.0 standards for accessibility
- Affordably priced to students at $39.95 per course

openstax | AN OPENSTAX ALLY

Anatomy & Physiology I Courseware

MODULE 1

INTRODUCTION TO THE HUMAN BODY

Explore the characteristics of life and how the body works to maintain stable conditions. Get introduced to a set of standard terms for body structures and for planes and positions in the body. Look at examples of medical imaging used to see inside the living body.

1.1 Overview of Anatomy and Physiology
The module begins with an overview of anatomy and physiology. Human anatomy is the scientific study of the body's structures. Some of these structures are very small and can only be observed and analyzed with the assistance of a microscope. Other larger structures can readily be seen, manipulated, measured, and weighed.

1.2 Functions of Human Life
The module covers the characteristics of life and how the body works. The different organ systems each have different functions and therefore unique roles to perform in physiology. These many functions can be summarized in terms of a few that we might consider definitive of human life organization, metabolism, responsiveness, movement, development, and reproduction.

1.3 Anatomical Terminology
The module introduces a set of standard terms for body structures and for planes and positions in the body.

1.4 Medical Imaging
The module brings examples of medical imaging used to see inside the living body.

MODULE 2

CHEMICAL LEVEL OF ORGANIZATION

The structure of atoms, the basic units of matter, determines the characteristics of chemical elements. Life cannot exist without many of these elements contribute to chemical reactions, to the transformation of energy, and to electrical activity and muscle contraction.

2.1 The Substance of the Universe
The module begins by examining elements and how the structures of atoms determine the characteristics of elements by the number of protons, neutrons, and electrons.

2.2 Chemical Reactions
The module covers how the elements contribute to chemical reactions, to the transformation of energy, and to electrical activity and muscle contraction.

2.3 Carbon, Organic and Inorganic Compounds
The module explores the importance of compounds for the body's structure and function. In general, these compounds are either inorganic or organic. An inorganic compound is a substance that does not contain both carbon and hydrogen. An organic compound, then, is a substance that contains both carbon and hydrogen. Organic compounds are synthesized via covalent bonds within living organisms, including the human body.

MODULE 3

CELLS

The body contains at least 200 distinct cell types. The cells represent the basic unit of life. These cells contain essentially the same internal structures yet they vary enormously in shape and function.

These tiny fluid-filled sacs house components responsible for the thousands of biochemical reactions necessary for an organism to grow and survive. Learn about the major components and functions of a prototypical, generalized cell and discover some of the different types of cells in the human body.

3.1 The Cell Membrane
The module covers the major components and functions of a prototypical, generalized cell and explores some of the different types of cells in the human body. The cell membrane is a biological membrane that separates the interior of all cells from the outside environment and protects the cell from its environment.

3.2 The Nucleus and DNA Replication
The nucleus is generally considered the control center of the cell because it stores all of the genetic instructions for manufacturing proteins. In order for an organism to grow, develop, and maintain its health, cells must reproduce themselves by dividing to produce two new daughter cells, each with the full complement of DNA as found in the original cell.

3.3 Cell Cycle and Growth
The module explores how cell cycle and biochemical reactions contribute to organisms' growth and survival. The cell cycle is the series of growth and development steps a cell undergoes between its "birth" - formation by the division of a mother cell - and reproduction - division to make two new daughter cells.

MODULE 4

TISSUE LEVEL OF ORGANIZATION

The different types of cells are not randomly distributed throughout the body; rather they occur in organized layers, a level of organization referred to as tissue. The variety in shape reflects the many different roles that cells fulfill in your body. The human body starts as a single cell at fertilization. As this fertilized egg divides, it gives rise to trillions of cells, each built from the same blueprint, but organizing into tissues and becoming irreversibly committed to a developmental pathway.

4.1 Tissues
The human body contains more than 200 types of cells that can all be classified into four types of tissues epithelial, connective, muscle, and nervous. Different types of tissues form membranes that enclose organs, provide a friction-free interaction between organs, and keep organs together.

4.2 Connective and Muscle Tissue
Connective tissue provides support and assists movement, stores and transports energy molecules, protects against infections, and contributes to temperature homeostasis. Two major forms of supportive connective tissue, cartilage and bone, allow the body to maintain its posture and protect internal organs.

Muscle tissue is characterized by properties that allow movement. Muscle cells are excitable; they respond to a stimulus. They are contractile, meaning they can shorten and generate a pulling force.

4.3 Nervous Tissue, Tissue Injury and Aging
The most prominent cell of the nervous tissue, the neuron, is characterized mainly by its ability to receive stimuli and respond by generating an electrical signal. Age affects all the tissues and organs of the body. Damaged cells do not regenerate as rapidly as in younger people. Perception of sensation and effectiveness of response are lost in the nervous system

ISBN: 978-1-913014-00-1

MODULE 5

INTEGUMENTARY SYSTEM

Explore the integumentary system - the skin and its accessory structures. The skin protects your inner organs and it is in need of daily care and protection to maintain its health. Get introduced to the integumentary system and some of the diseases, disorders, and injuries that can affect it.

5.1 The Nature of Skin
The skin is the largest organ of the human body, weighing approximately 16% of our bodyweight. Skin consists of multiple layers, epidermis, dermis, and hypodermis. Human skin has numerous functions, it is the major interface between the environment and the human organs and so it serves many specialized functions that facilitate survival.

5.2 The Hair, Nails and Glands
Accessory structures of the skin include hair, nails, sweat glands, and sebaceous glands. Hair is made of dead keratinized cells, and gets its color from melanin pigments. Nails, also made of dead keratinized cells, protect the extremities of our fingers and toes from mechanical damage.

5.3 Functions of The Integumentary System
The skin plays important roles in protection, sensing stimuli, thermoregulation, and vitamin D synthesis. It is the first layer of defense to prevent dehydration, infection, and injury to the rest of the body.

5.4 Diseases, Disorders and Injuries of The Skin
The module explains how the integumentary system interacts with some of the diseases, disorders, and injuries that can affect it.

Most skin disorders are relatively benign, but a few, including melanomas, can be fatal if untreated. Skin disorders like the albinism and vitiligo affect the appearance of the skin and its accessory organs.

MODULE 6

BONE TISSUE

Your skeleton is a structure of living tissue that grows, repairs, and renews itself. The bones within it are dynamic and complex organs that serve a number of important functions. While the soft tissue of a once living organism will decay and fall away over time, bone tissue will undergo a process of mineralization, effectively turning the bone to stone.

6.1 The Skeletal System
The major functions of the bones are body support, facilitation of movement, protection of internal organs, storage of minerals and hematopoiesis.

6.2 The Bones of The Body
The 206 bones that compose the adult skeleton are divided into five categories based on their shapes. Their shapes and their functions are related such that each categorical shape of bone has a distinct function.

6.3 The Anatomy of Bone
Bone tissue (osseous tissue) differs greatly from other tissues in the body. Bone is hard and many of its functions depend on that characteristic hardness.

6.4 Ossification of The Bone
The formation of the bone is called ossification (osteogenesis). There are two types of ossification intramembranous and endochondral ossification.

6.5 The Effect of Aging on Bones
Osteoporosis is a disease characterized by a decrease in bone mass that occurs when the rate of bone resorption exceeds the rate of bone formation, a common occurrence as the body ages.

MODULE 7

AXIAL SKELETAL SYSTEM

The skeletal system forms the rigid internal framework of the body. It consists of the bones, cartilages, and ligaments. Bones support the weight of the body, allow for body movements, and protect internal organs. Each bone of the body serves a particular function, and therefore bones vary in size, shape, and strength based on these functions. The adult axial skeleton consists of 80 bones that form the head and body trunk.

7.1 Divisions of The Skeletal System
The skeleton is subdivided into two parts. The axial skeleton forms a vertical axis that includes the head, neck, back, and chest. The appendicular skeleton consists of 126 bones and includes all of the bones of the upper and lower limbs plus the bones that anchor each limb to the axial skeleton.

7.2 The Anatomy of The Skull
The skull consists of the rounded brain case that houses the brain and the facial bones that form the upper and lower jaws, nose, orbits, and other facial structures.

7.3 Anatomy of The Vertebral Column
The adult vertebral column consists of 24 vertebrae, plus the sacrum and coccyx. The vertebrae are divided into three regions cervical vertebrae, thoracic vertebrae, and lumbar vertebrae. The vertebral column is curved, with two primary curvatures and two secondary curvatures.

7.4 The Anatomy of The Thoracic Cage
The thoracic cage is composed of 12 pairs of ribs with their costal cartilages and the sternum. The ribs are anchored posteriorly to the 12 thoracic vertebrae. The sternum consists of the manubrium, body, and xiphoid process.

7.5 The Embryonic Development of The Axial Skeleton
The bones of the skull arise from mesenchyme during embryonic development in two different ways. The first mechanism produces the bones that form the top and sides of the brain case. The second mechanism for bone development in the skull produces the facial bones and floor of the brain case.

MODULE 8

APPENDICULAR SKELETON

Your skeleton provides the internal supporting structure of the body. Attached to this are the limbs, whose 126 bones constitute the appendicular skeleton. Because of our upright stance, different functional demands are placed upon the upper and lower limbs. The bones of the lower limbs are adapted for weight-bearing support and stability. The upper limbs are highly mobile and can be utilized for a wide variety of activities.

8.1 The Bones and Composition of The Pectoral Girdle
The bones that attach each upper limb to the axial skeleton form the pectoral girdle (shoulder girdle). This consists of two bones, the scapula and clavicle.

8.2 Disorders of The Appendicular System
Due to our constant use of the hands and the rest of our upper limbs, an injury to any of these areas will cause a significant loss of functional ability. Many fractures result from a hard fall onto an outstretched hand.

8.3 The Structure and Function of The Pelvic Girdle
The combination of the hip bone, the sacrum, and the coccyx forms the pelvis. The pelvis has a pronounced anterior tilt. The primary function of the pelvis is to support the upper body and transfer body weight to the lower limbs. It also serves as the site of attachment for multiple muscles.

8.4 The Bones of the Lower Limb
There are 30 bones in each lower limb. These are the femur, patella, tibia, fibula, seven tarsal bones, five metatarsal bones, and 14 phalanges. The femur is the single bone of the thigh. Its rounded head articulates with the acetabulum of the hip bone to form the hip joint.

8.5 Ossification of The Appendicular Bones
Endochondral ossification, the process that converts the hyaline cartilage model into bone, begins in most appendicular bones by the twelfth fetal week. This begins as a primary ossification center in the diaphysis, followed by the later appearance of one or more secondary ossifications centers.

ISBN: 978-1-913014-00-1

MODULE 9

JOINTS

Joints are the location where bones come together. Many joints allow for movement between the bones. At these joints, the articulating surfaces of the adjacent bones can move smoothly against each other. However, the bones of other joints may be joined to each other by connective tissue or cartilage. These joints are designed for stability and provide for little or no movement.

Understanding the relationship between joint structure and function will help to explain why particular types of joints are found in certain areas of the body.

9.1 The Nature of Joints
The structural classification of joints is based on whether the articulating surfaces of the adjacent bones are directly connected by fibrous connective tissue or cartilage, or whether the articulating surfaces contact each other within a fluid-filled joint cavity.

9.2 Fibrous, Cartilaginous, Synovial Joints
At a fibrous joint, the adjacent bones are directly connected to each other by fibrous connective tissue, and thus the bones do not have a joint cavity between them. Cartilaginous joints are connected entirely by cartilage (fibrocartilage or hyaline). Cartilaginous joints allow more movement between bones than a fibrous joint but less than the highly mobile synovial joint with a joint cavity as the key structural characteristic.

9.3 Types of Body Movement
The variety of movements provided by the different types of synovial joints allows for a large range of body motions and gives you tremendous mobility.

9.4 Articulations of the Vertebral Column
There are two distinct sets of articulations in the vertebral column those between the bodies and intervertebral discs which form synchondroses and which are amphiarthrodial as regards movement; those between the articular processes which form arthrodial joints.

9.5 Knees, Ankles, and Development of Joints
The knee joint is the largest joint of the body; it functions as a hinge joint, allowing flexion and extension of the leg.

MODULE 10

MUSCLE TISSUE

Examine the structure and function of three types of muscles the skeletal muscles, the cardiac muscle, and the smooth muscle. Skeletal muscles are visible just under the skin, particularly of the limbs. Cardiac muscle, found in the heart, is pumping blood through the circulatory system. Smooth muscle is concerned with various involuntary movements, such as having one's hair stand on end when cold or frightened, or moving food through the digestive system.

10.1 Skeletal Muscle
The best-known feature of skeletal muscle is its ability to contract and cause movement. Skeletal muscles act not only to produce movement but also to stop movement, such as resisting gravity to maintain posture.

10.2 Muscle Contraction and Relaxation
The sequence of events that result in the contraction of an individual muscle fiber begins with a signal - the neurotransmitter - from the motor neuron innervating that fiber.

10.3 Motor Units and Muscle Fiber
Groups of motor units often work together to coordinate the contractions of a single muscle. All muscle fibers in a motor unit are of the same fiber type. When a motor unit is activated, all of its fibers contract.

10.4 Muscle Performance and Regeneration
Muscle tissue arises from embryonic mesoderm. Satellite cells help to repair skeletal muscle cells. Smooth muscle tissue can regenerate from stem cells, whereas dead cardiac muscle tissue is replaced by scar tissue.

MODULE 11

MUSCULAR SYSTEM

Physical activities require movement of particular skeletal muscles. In some cases, the muscle is named by its shape, and in other cases, it is named by its location or attachments to the skeleton. The actions of the skeletal muscles are covered in a regional manner, from the head down to the toes.

11.1 Skeletal Muscles and Fascicle Arrangement
The arrangement of the fascicles in the skeletal muscle fascicles can be parallel, circular, convergent, pennate, fusiform, or triangular. Each arrangement has its own range of motion and ability to do work.

11.2 Axial Muscles of the Head, Neck and Back
The axial muscles are grouped based on location, function, or both. The muscles of the neck stabilize and move the head. The muscles of the anterior neck assist in swallowing and speech by controlling the positions of the larynx, and the hyoid bone.

11.3 Axial Muscles of The Abdominal Wall and Thorax
The muscles of the vertebral column, thorax, and abdominal wall extend, flex, and stabilize different parts of the body's trunk. The deep muscles of the core of the body help maintain posture as well as carry out other functions.

11.4 Muscles of The Pectoral Girdle and Upper Limbs
The extrinsic muscles of the hands originate along the forearm and insert into the hand in order to facilitate crude movements of the wrists, hands, and fingers. These allow our fingers to make precise movements, such as typing and writing. They both originate and insert within the hand.

MODULE 12

NERVOUS SYSTEM AND NERVOUS TISSUE

The nervous system is a very complex organ system. Start with a big picture and then explore nervous (neural) tissue, both its structure and its function.

12.1 Overview of The Nervous System
The nervous system can be divided into two major regions the central and peripheral nervous systems. The central nervous system (CNS) is the brain and spinal cord, and the peripheral nervous system (PNS) is everything else.

12.2 Neurons and Neurotransmission
The basis of the electrical signal within a neuron is the action potential that propagates down the axon. For a neuron to generate an action potential, it needs to receive input from another source, either another neuron or a sensory stimulus. There are several systems of neurotransmitters that are found at various synapses in the nervous system.

ISBN: 978-1-913014-00-1

MODULE 13

ANATOMY OF THE NERVOUS SYSTEM

The nervous system is responsible for controlling much of the body, both through somatic (voluntary) and autonomic (involuntary) functions. The structures of the nervous system must be described in detail to understand how many of these functions are possible.

13.1 The Embryonic Nervous System
The place to start this study of the nervous system is the beginwning of the individual human life, within the womb. The embryonic development of the nervous system allows for a simple framework on which progressively more complicated structures can be built.

13.2 The Central Nervous System
The brain and the spinal cord are the central nervous system, and they represent the main organs of the nervous system. The spinal cord is a single structure, whereas the adult brain is described in terms of four major regions the cerebrum, the diencephalon, the brain stem, and the cerebellum.

13.3 Circulation and The Central Nervous System
Metabolic wastes are collected in cerebrospinal fluid that circulates through the CNS. This fluid is produced by filtering blood at the choroid plexuses in the four ventricles of the brain. It then circulates through the ventricles and into the subarachnoid space.

13.4 The Peripheral Nervous System
The peripheral nervous system (PNS) is not as contained as the central nervous system (CNS) because it is defined as everything that is not the central nervous system. Some peripheral structures are incorporated into the other organs of the body. The primary role of the PNS is to connect the Central Nervous System to the organs, limbs, and skin.

MODULE 14

NERVOUS SYSTEM FUNCTION

The somatic nervous system is traditionally considered a division within the peripheral nervous system. Somatic refers to a functional division, whereas peripheral refers to an anatomic division.

The somatic nervous system is responsible for our conscious perception of the environment and for our voluntary responses to that perception by means of skeletal muscles. Peripheral sensory neurons receive input from environmental stimuli, but the neurons that produce motor responses originate in the central nervous system.

14.1 The Different Senses
Stimuli in the environment activate specialized receptor cells in the peripheral nervous system. Different types of stimuli are sensed by different types of receptor cells.

14.2 The Spinal Cord and Central Processing
Specific regions of the Central Nervous System coordinate different somatic processes using sensory inputs and motor outputs of peripheral nerves.

A sensory pathway that carries peripheral sensations to the brain is referred to as an ascending pathway, or ascending tract. The various sensory modalities each follow specific pathways through the Central Nervous System.

14.3 Responses and Reflexes
The defining characteristic of the somatic nervous system is that it controls skeletal muscles. Somatic senses inform the nervous system about the external environment, but the response to that is through voluntary muscle movement.

ISBN: 978-1-913014-00-1

MODULE 15

THE AUTONOMIC NERVOUS SYSTEM

The autonomic nervous system is about responding to threats - the fight-or-flight response. Also, there are the responses referred to as "rest and digest." The heart rate will slow. Breathing will return to normal. The digestive system has a big job to do. Much of the function of the autonomic system is based on the connections within an autonomic, or visceral, reflex.

15.1 The Divisions of The Autonomic Nervous System

The two divisions of the autonomic nervous system are the sympathetic division and the parasympathetic division. The sympathetic system is associated with the fight-or-flight response, and parasympathetic activity is referred to by the epithet of rest and digest. Homeostasis is the balance between the two systems.

To respond to a threat—to fight or to run away—the sympathetic system causes divergent effects as many different effector organs are activated together for a common purpose. The parasympathetic activates when the external environment does not present any immediate danger; a restful mode descends on the body, and the digestive system is more active.

15.2 The Nature of Reflexes

A reflex action often involves a very simple nervous pathway called a reflex arc. A reflex arc starts off with receptors being excited. They then send signals along a sensory neuron to your spinal cord, where the signals are passed on to a motor neuron. These reflexes are known as autonomic reflexes.

15.3 The Central Control of The Nervous System

The central nervous system (CNS) controls most functions of the body and mind. It consists of two parts the brain and the spinal cord. The brain is the center of our thoughts, the interpreter of our external environment, and the origin of control over body movement.

Central control of autonomic reflexes is different than for somatic reflexes. When the stimulus is unilateral (presented to only one eye), the response is bilateral (both eyes). The same is not true for somatic reflexes. If you touch a hot radiator, you only pull that arm back, not both.

15.4 Things That Impact on The Autonomic Nervous System

An important way to understand the effects of native neurochemicals in the autonomic system is in considering the effects of pharmaceutical drugs. These effects will primarily be based on how drugs act at the receptors of the autonomic system neurochemistry.

One important drug that affects the autonomic system broadly is not a pharmaceutical therapeutic agent associated with the system. This drug is nicotine. The effects of nicotine on the autonomic nervous system are important in considering the role smoking can play in health.

ISBN: 978-1-913014-00-1

Anatomy & Physiology II Courseware

MODULE 1

ENDOCRINE SYSTEM

Certain cells send chemical signals to other cells in the body that influence their behavior. This long-distance intercellular communication, coordination, and control is critical for homeostasis, and it is the fundamental function of the endocrine system.

1.1 Role of the Endocrine Glands and Hormones
The module explains the role of the endocrine glands in growth and development, regulation of metabolism, reproduction, fluid and electrolyte balance, and regulation of life-sustaining bodily functions.

1.2 Endocrine Glands on Charts and Models
The module explains the location of the endocrine glands on models and charts; identify the properties of each of the major endocrine glands, including the hormones secreted.

1.3 Endocrine Hormones and Endocrine System Aging
The module explains about the influence of endocrine hormones on other systems. In addition it covers the aging of endocrine system.

MODULE 2

BLOOD

Single-celled organisms do not need blood. They obtain nutrients directly from and excrete wastes directly into their environment. The human organism cannot do that. Our large, complex bodies need blood to deliver nutrients to and remove wastes from our trillions of cells. The heart pumps blood throughout the body in a network of blood vessels. Together, these three components—blood, heart, and vessels—makes up the cardiovascular system.

2.1 Blood Components
The module explains the function and components of blood. The liquid plasma and formed elements- red blood cells, white blood cells, platelets.

2.2 Blood Clotting and Importance of Blood Typing
The module explains the proper sequence and functions of the components involved in blood clotting. It also covers the importance of blood typing, techniques for determining the ABO and Rh blood groups, understanding of coagulation, hematological, and blood chemistry blood testing.

MODULE 3

CARDIAC

Learn about the remarkable pump that propels the blood into the vessels. The heart and its contraction develops the pressure that ejects blood into the major vessels the aorta and pulmonary trunk. From these vessels, the blood is distributed to the remainder of the body. Together, these three components—blood, heart, and vessels—makes up the cardiovascular system.

3.1 Heart Components and the Blood Flow
The module introduces the internal and external structural components of the heart and describes the flow of blood through the chambers. You will also learn the sequential movements of the heart valves and the cardiac conduction system.

3.2 Cardiac Muscle Features and the Cardiac Cycle
The module introduces the unique features of cardiac muscle and the role of heart sounds in the cardiac cycle. In each cardiac cycle, the heart contracts, pushing out the blood and pumping it through the body; this is followed by a relaxation phase, where the heart fills with blood.

3.3 Cardiac Output and Homeostasis; Embryology of the Heart
Cardiac output is a measurement of the amount of blood pumped by each ventricle in one minute. The module will help you to understand the blood flow to cardiac muscle as well as the effects of alteration of cardiac output on homeostasis. The module will also explore the embryology of the heart.

MODULE 4

VASCULATURE

Learn about the major vessels the aorta, pulmonary trunk, and others. From these vessels, the blood is distributed to the remainder of the body. Together, these three components—blood, heart, and vessels—makes up the cardiovascular system.

4.1 The Venous and Arterial Vessels
The module explains the structure and function of vessels and differentiate between the venous and arterial vessels. Whereas arteries specifically carry blood “away” from the heart, veins carry blood “toward” the heart. Generally speaking, arterial vessels contain oxygenated blood, and venous vessels carry blood that is low in oxygen.

4.2 Blood Flow and Blood Pressure
The module explains the principles of blood flow, blood pressure, and resistance. Blood flow refers to the movement of blood through the vessels from arteries to the capillaries and then into the veins. Pressure is a measure of the force that the blood exerts against the vessel walls as it moves the blood through the vessels.

4.3 The Circulatory Pathways
The module describes the factors associated with the regulation and homeostasis of the peripheral circulatory system. Moreover, it helps to identify the major arteries and veins of the circulatory pathways.

ISBN: 978-1-913014-01-8

MODULE 5

LYMPHATICS AND IMMUNITY

Learn about the components and anatomy of the lymphatic system and about the role of the innate immune response against pathogens. Then explore the power of the adaptive immune response to cure disease and find out about immunological deficiencies and over-reactions of the immune system. Finally, find out the role of the immune response in transplantation and cancer.

5.1 The Lymphatic and Immune System
The module describes the major anatomic features of the lymphatic and immune system. The lymphatic system plays an integral role in the immune functions of the body. It is the first line of defense against disease. This network of vessels and nodes transports and filters lymph fluid containing antibodies and lymphocytes (good) and bacteria (bad). The immune system is the complex collection of cells and organs that destroys or neutralizes pathogens that would otherwise cause disease or death.

5.2 Lymphocytes and T Lymphocytes
The module explains the humoral immunity, B lymphocytes, antibodies and the cell-mediated response and T lymphocytes as components of the immune system.

5.3 Immune Response, Immune Disorders and Immunotherapy
The module covers the immune response, immune disorders, transplantation, and immunotherapy. For example, the body fights bacterial pathogens with a wide variety of immunological mechanisms, essentially trying to find one that is effective. While fungal infections are largely opportunistic infections that take advantage of suppressed immune responses.

MODULE 6

RESPIRATORY SYSTEM

A typical human cannot survive without breathing for more than 3 minutes. Every cell in the body needs to run the oxidative stages of cellular respiration, the process by which energy is produced in the form of adenosine triphosphate (ATP). For oxidative phosphorylation to occur, oxygen is used as a reactant and carbon dioxide is released as a waste product. The circulatory system transports gases from the lungs to tissues throughout the body and vice versa.

6.1 The Lungs and the Structures of the Airway
The module covers the structures of the airway and the associated structures related to gas exchange in the respiratory membrane.

6.2 Transport of Gases and Changes in the Pulmonary System
The module explains the transport of gases in the blood and factors influencing respiration. Gas exchange during respiration occurs primarily through diffusion. Diffusion is a process in which transport is driven by a concentration gradient. The air in the lungs has a higher concentration of oxygen than that of oxygen-depleted blood and a lower concentration of carbon dioxide.

MODULE 7

GASTROINTESTINAL SYSTEM

The digestive system is continually at work. Your stomach and intestines are busy absorbing the vitamins and other nutrients. By the time any waste material is excreted, the body has appropriated all it can. Examine the structure and functions of the digestive system organs, and explores the mechanics and chemistry of the digestive processes.

7.1 The Regions of the Digestive System
The module explains the structures associated with the different regions of the digestive system. Regions of the digestive system can be divided into two main parts: the alimentary tract and accessory organs. The alimentary tract of the digestive system is composed of the mouth, pharynx, esophagus, stomach, small and large intestines, rectum and anus.

7.2 The Chemical Digestion and Mechanical Movements of the GI Tract
The module explains the principles and regulation of chemical and mechanical digestion. It also explains the accessory organs of digestion and their structure and major functions.

MODULE 8

NUTRITION AND METABOLISM

Explore some of the chemical reactions essential to life, the sum of which is referred to as metabolism. Catabolic reactions break down larger molecules, such as carbohydrates, lipids, and proteins from ingested food, into their constituent smaller parts. Anabolic reactions synthesize larger molecules from smaller constituent parts. Examine the various chemical reactions that are important to sustain life, including why you must have oxygen, how mitochondria transfer energy, and the importance of certain "metabolic" hormones and vitamins.

8.1 The Classes of Nutrients
The module defines metabolism and major classes of nutrients used in metabolism: carbohydrates, fats, dietary fiber, minerals, proteins, vitamins, and water.

8.2 Carbohydrate, Protein, and Lipid Metabolism
The module covers the steps involved in carbohydrate, protein, and lipid metabolism.

8.3 Energy and Heat Balance
The module explains the process of energy and heat balance, and examine metabolic states. The body tightly regulates the body temperature through a process called thermoregulation. The basal metabolic rate (BMR) describes the amount of daily energy expended by humans. Evaporation transfers heat as water changes state from a liquid to a gas.

8.4 Nutrition and Diet
Nutrition and diet affect your metabolism. More energy is required to break down fats and proteins than carbohydrates; however, all excess calories that are ingested will be stored as fat in the body. On average, a person requires 1500 to 2000 calories for normal daily activity.

ISBN: 978-1-913014-01-8

MODULE 9

URINARY SYSTEM

Explore the anatomy of the urinary system and how it enables the physiologic functions critical to homeostasis. It is best to think of the kidney as a regulator of plasma makeup rather than simply a urine producer.

9.1 The General Function of the Urinary System
The module describes the general function of the urinary system, and the major gross anatomic and histological features. The purpose of the urinary system is to eliminate waste from the body, regulate blood volume and blood pressure, control levels of electrolytes and metabolites, and regulate blood pH.

9.2 Converting Filtrate to Urine
The module covers the process of converting filtrate to urine, tubular reabsorption, tubular secretion, and urine concentration.

9.3 Regulation of the Urinary System
The module covers the endocrine regulation of the urinary system, regulation of renal blood flow, and regulation of fluid volume and homeostasis.

9.4 Water and Electrolyte Balance
The module explains the fluid compartments of the body and the water and electrolyte balance. Water will move into and out of cells and tissues, depending on the relative concentrations of the water and solutes found there. Sodium, potassium, chloride, bicarbonate, calcium, and phosphate are the six electrolytes most important in terms of body functioning.

9.5 Acid-base Imbalance in the Body
The module describes the effects and treatments of acid-base imbalance in the body. Proper physiological functioning depends on a very tight balance between the concentrations of acids and bases in the blood. The respiratory and renal systems also play major roles in acid-base homeostasis by removing CO2 and hydrogen ions, respectively, from the body.

MODULE 11

PREGNANCY AND DEVELOPMENT

The dramatic changes of fertilization, embryonic development, and fetal development are followed by remarkable adaptations of the newborn to life outside the womb. An offspring's normal development depends upon the appropriate synthesis of structural and functional proteins.

11.1 Fertilization and the Stages of Fetal Development
The module explains the processes associated with fertilization and the zygote, development the pre-embryo and embryo, and stages of fetal development.

11.2 Maternal Physiology in Pregnancy, Labor, and Birth
The module covers the changes to maternal physiology in pregnancy, labor, and birth. It also explains issues associated with post-partum adjustment for the mother and infant, and the issues associated with lactation.

MODULE 10

REPRODUCTIVE SYSTEM

Explore the male and female reproductive systems. A child's birth is proof of the healthy functioning of both. In addition, her parents' endocrine systems had to secrete the appropriate regulating hormones to induce the production and release of unique male and female gametes, reproductive cells containing the parents' genetic material.

10.1 The Male Reproductive Structures
The module covers the anatomy of the male reproductive structures, and male gametogenesis.

10.2 The Female Reproductive Structures
The module describes the anatomy of the female reproductive structures, and female gametogenesis. It also explains the events associated with the ovarian and menstrual cycles, and contraception.

10.3 The Development of the Male and Female Reproductive Systems
The module describes the development of the male and female reproductive systems.

ISBN: 978-1-913014-01-8