

**Bio Medical Core  
Health Sciences 1111  
Course Objectives**

*Module 11 – Blood, Lymphatics, Inflammation and Immunity*

*Objective 1*

Contrast the general roles of the blood, lymphatic system and interstitial fluid in servicing the cells and tissues.

*Objective 2*

Define the principal physical characteristics of blood.

*Objective 3*

Identify the major formed elements of the blood including the places of formation.

*Objective 4*

Describe the structure of erythrocytes, including the substance which is important in the carrying of oxygen and carbon dioxide.

*Objective 5*

Define erythropoiesis and identify the diseases related to the imbalance between erythropoiesis and cell destruction.

*Objective 6*

Define reticulocyte and explain the significance of reticulocyte count.

*Objective 7*

Describe three changes which occur within erythrocytes as they mature.

*Objective 8*

Define “leukocyte” and list the two major groups with examples of each.

*Objective 9*

Describe the role of leukocytes in phagocytosis and in antibody production. Identify the kinds of leukocytes which function in each role.

*Objective 10*

Describe the importance of a differential count in the diagnosis of infections and list normal values.

*Objective 11*

List the normal values for a CBC.

*Objective 12*

Distinguish between leukocytosis and leukocytopenia; between plasma and serum.

*Objective 13*

Describe the structure of thrombocytes and explain their role in blood coagulation.

*Objective 14*

Identify the function of the albumin and globulin of blood plasma

*Objective 15*

Cite the main kinds of solutes which are dissolved in the water of the plasma and identify how most substances are transported (dissolved or suspended).

*Objective 16*

Define the three stages of hemostasis.

*Objective 17*

Describe the extrinsic and intrinsic pathways of coagulation.

*Objective 18*

Name the substance formed in each of the three stages of coagulation.

*Objective 19*

Identify the factors which promote or inhibit blood clotting.

*Objective 20*

Contrast a thrombus and an embolus.

*Objective 21*

Given any of the four blood groups in the ABO system, identify the antigens (agglutinogens) to be found on the erythrocytes and the antibodies (agglutinins) to be found in the plasma of that blood group.

*Objective 22*

Compare the Rh system with the ABO system as to antigens (agglutinogens) and antibodies (agglutinins).

*Objective 23*

Describe erythroblastosis fetalis as a harmful antigen-antibody reaction.

*Objective 24*

Compare the location and composition of intercellular fluid and lymph.

*Objective 25*

Identify the causes of hemorrhagic, hemolytic, aplastic and sickle cell anemias.

*Objective 26*

Identify the symptoms of polycythemia, infectious mononucleosis and leukemia.

*Objective 27*

Define the medical terminology associated with blood.

*Objective 28*

Distinguish active vs. passive immunity and within each also describe the natural vs. artificial acquisition of immunity.

*Objective 29*

Define the overall purpose and select the four fundamental symptoms of inflammation.

*Objective 30*

Identify the stages of inflammation and the causes of the four signs of inflammation.

*Objective 31*

Identify the meaning of the following terms: pus; abscess; ulcer

*Objective 32*

Compare the outcome of repair work done by parenchymal cells with that done by stromal cells.

*Objective 33*

Select the type of parenchymal cells which have reproductive potential.

*Objective 34*

Explain how the resolution process may result in the formation of adhesions, scabs and granulation tissue.

*Objective 35*

Identify the clinically important groups of lymph nodes and describe how lymph is moved through the body. Also, define edema.

*Objective 36*

Distinguish nonspecific vs. specific resistance to disease.

*Objective 37*

Describe the following nonspecific resistance mechanisms: skin and mucous membranes; chemical factors; interferon; complement; phagocytosis; inflammation; fever

*Objective 38*

Describe immunity as a form of specific resistance to disease.

*Objective 39*

Contrast cellular immunity vs. humoral immunity.

*Objective 40*

Distinguish the developmental origin of T cells and B cells.

*Objective 41*

Describe the roles of the different types of T cells in cellular immunity.

*Objective 42*

Describe the role of B cells in humoral immunity.

*Objective 43*

Contrast primary vs. secondary immune responses and explain the relationship between secondary responses and immunization.

*Objective 44*

Describe the relationship between immune system and prevention of cancer.

*Objective 45*

Explain the general clinical application of monoclonal antibodies.

*Objective 46*

Describe the immunological basis of allergies, tissue rejection, immunosuppressive therapy, autoimmune diseases and AIDS.

*Objective 47*

Distinguish active vs. passive immunity and within each also describe the natural vs. artificial acquisition of immunity.

## *Module 12 – Cardiovascular System*

In this unit we will study the structure and function of the heart and of blood vessels. We will also study some principles of physics which affect blood flow. Some of the pathological conditions which can threaten the system's efficiency will also be presented.

The circulatory system is literally the "heart" of the living human body. No cell can live if its means of interchange with the life-sustaining blood is terminated. The heart generates the pressure which keeps the blood moving and the cells adequately supplied.

The arteries and veins are the supply lines between the heart and the capillaries which in turn, supply the cells. The tubes are not passive conduits of fluid, but also perform a regulatory function. This insures that the more active cells of the body will receive more blood in accordance with their needs, while less active parts receive corresponding less.

### *Objective 1*

List the overall function of the circulatory system.

### *Objective 2*

Identify the location and boundaries of the heart in the mediastinum.

### *Objective 3*

Describe the structure of the pericardium and the heart wall.

### *Objective 4*

Identify the location of the chambers, great blood vessels, and valves of the heart and trace blood flow through the heart.

### *Objective 5*

Describe the initiation and conduction of the electrical impulse through the conduction system of the heart.

### *Objective 6*

Label and explain the deflection waves of a normal electrocardiogram.

### *Objective 7*

Describe the major features of the blood supply to the heart (myocardium).

### *Objective 8*

Describe the pressure changes associated with blood flow through the heart.

### *Objective 9*

Define systole and diastole as the two principal events of the cardiac cycle and identify the position of the heart valves during each phase of the cycle.

### *Objective 10*

Describe the overall time required to complete the events of the cardiac cycle.

### *Objective 11*

Describe the sounds of the heart and their clinical significance.

### *Objective 12*

Define cardiac output and identify those factors that determine it.

*Objective 13*

Define Starling's "Law of the Heart."

*Objective 14*

Contrast the effects of sympathetic and parasympathetic stimulation of the heart.

*Objective 15*

Describe the effects of the carotid sinus reflex, the aortic reflex, the right heart atrial reflex and other factors such as chemicals, temperature, emotions, sex and age on cardiac output.

*Objective 16*

Define hypovolemic or "circulatory" shock and describe the homeostatic mechanisms which compensate for circulatory shock.

*Objective 17*

List the risk factors in heart disease.

*Objective 18*

Describe the following abnormalities: atrioventricular block; atrial flutter; atrial fibrillation; ventricular fibrillation

*Objective 19*

Describe the use of cardiac catheterization, hypothermia, the heart-lung bypass and artificial parts.

*Objective 20*

Identify the two major factors which contribute to the pressure exerted at any point within a fluid at rest.

*Objective 21*

Describe the influence of each of the factors listed below on the rate of flow within moving fluid such as blood.

*Objective 22*

Describe pulse and identify the general location of arteries where pulse may be felt.

*Objective 23*

Cite the factors that assist the return of venous blood to the heart.

*Objective 24*

Define pulse and identify the general location of arteries where pulse may be felt.

*Objective 25*

Compare the several kinds of abnormal pulse rates.

*Objective 26*

Define blood pressure and describe one clinical method for recording diastolic and systolic blood pressure.

*Objective 27*

Contrast the clinical significance of systolic, diastolic and pulse pressures.

*Objective 28*

Identify the principal arteries and veins of the systemic circulation.

*Objective 29*

Compare general functions of the following: pulmonary; systemic

*Objective 30*

Describe the function and the route of blood in the pulmonary circulation.

*Objective 31*

Describe the function and the route of the blood in the hepatic portal circulation.

*Objective 32*

Describe the function and the route of blood in fetal circulation.

*Module 13 – Respiratory System*

It is commonly known that a person will die if the oxygen supply is cut. In this module, we will see the efficiency of the respiratory and cardiovascular systems in supplying each cell of the body with oxygen.

Much of the work of the respiratory system is involved in changing the volumes of the lungs so that air moves in and out passively. We will take a look at some of the principles of physics which will help us understand why breathing “works.” The respiratory tract is one of the most important portals of entry for pathogenic viruses, bacteria and fungi. In this module we will therefore spend some time studying the microbiology of the respiratory system.

*Objective 1*

Cite normal atmospheric pressure (at sea level) in pounds per square inch and in centimeters or millimeters of Hg and compare this with the relative pressure of the air above sea level and below sea level.

*Objective 2*

Define barometer

*Objective 3*

Given a patient’s blood pressure, identify the height of the mercury column which the blood pressure could support during systole and during diastole.

*Objective 4*

Describe the principles involved in the five gas laws.

*Objective 5*

Identify the principle involved in the use of medicine dropper and of a drinking straw.

*Objective 6*

Identify the organs of the respiratory system in the order in which air will pass through them for the exterior.

*Objective 7*

List the functions of the internal and external portions of the nasal cavity.

*Objective 8*

Identify important features of the three regions of the pharynx, and indicate the function of these regions in respiration and/or digestion.

*Objective 9*

Identify the anatomical features of the larynx as related to respiration and to voice production.

*Objective 10*

Define the following: tracheotomy; intubation

*Objective 11*

Identify the covering of the lungs and the gross anatomical features of the lungs, including their lengthwise boundaries.

*Objective 12*

Describe the structure of a lobule of the lungs.

*Objective 13*

Describe the role of alveoli in the diffusion of respiratory gasses and how the alveoli are well fitted to perform their role.

*Objective 14*

Relate changes in thoracic volume to muscle contractions and to the movement of air into or out of the lungs. Also, list the sequence of volume and pressure changes involved in inspiration and expiration.

*Objective 15*

Compare the volumes and capacities of air exchanged during ventilation, tidal volume; inspiratory reserve; expiratory reserve; residual volume; minimal volume; vital capacity.

*Objective 16*

Describe the mechanisms of external and internal respiration by arranging tissues in the order of decreasing  $pO_2$  and  $pCO_2$ .

*Objective 17*

Identify how carbon dioxide and oxygen are carried by the blood and the relative amounts carried in each form.

*Objective 18*

Describe the respective role played by the medulla and the pons in the control of respiration.

*Objective 19*

Compare the roles of the Hering-Breuer reflex and the pneumotaxic center in controlling respiration.

*Objective 20*

Describe the effects of chemical stimuli and pressure in determining the rate of respiration. (In terms of chemo- and presso- receptors and reflex activity.)

*Objective 21*

Describe the effects of pollutants on the epithelium of the respiratory system and their relationship to bronchogenic carcinoma.

*Objective 22*

Define the following: nasal polyps; bronchial asthma; bronchitis; emphysema; pneumonia; tuberculosis; infant respiratory distress syndrome; sudden infant death syndrome.

*Objective 23*

Define the medical terminology associated with the respiratory system.

*Objective 24*

Describe how the nebulizer can be used to carry drugs, etc. all the way to the alveolar sacs.

*Objective 25*

Describe the normal flora of the upper respiratory tract and compare this with the normal flora of the lower tract.

*Objective 26*

Identify the respiratory problems caused by the following microbes: respiratory viruses; streptococcus pneumoniae; streptococcus pyogenes; haemophilus influenzae; mycoplasma

*Objective 27*

Identify the features contributing to the virulence of pneumococci and to group A beta hemolytic streptococci.

*Objective 28*

Compare alpha, beta and gamma streptococci as to their appearance on blood agar culture plates.

*Objective 29*

Describe the pathogenicity of the influenza virus and the reason why vaccination has not been totally successful.

*Objective 30*

Cite the conditions which tend to predispose to candida infections.

*Module 14 – Urinary System*

The kidneys are often regarded as organs which eliminate fluid wastes. In this unit, we will learn that they also play an important role in the maintenance of body homeostasis. We will see that the kidneys, like the lungs, help to regulate blood pH. We will gain insight of how system of the body function together to perform a task as we study the relationships between the circulatory system and the urinary system. The amount of work which the kidneys perform minute after minute during our life will be evident. Finally, studying the intricate structures which make all of this possible will help to gain an even greater appreciation of the human body.

*Objective 1*

Describe or identify on a diagram the gross anatomical features of the kidneys and urinary system organs.

*Objective 2*

Describe or identify on a diagram the microscopic structure of the nephron.

*Objective 3*

Describe the blood supply to the kidneys, including the unique features of the arterial and capillary arrangement.

*Objective 4*

Name the three basic physiological processes involved in urine formation.

*Objective 5*

Describe the processes of glomerular filtration.

*Objective 6*

Compare the chemical composition of blood plasma, glomerular filtrate and urine.

*Objective 7*

Identify the forces that support and oppose filtration of the blood in the kidneys and calculate net filtration pressures.

*Objective 8*

Define renal suppression.

*Objective 9*

Describe the process of tubular reabsorption and the renal threshold.

*Objective 10*

Compare obligatory and facultative reabsorption of water.

*Objective 11 and 12*

Describe the overall process of tubular secretion and the secretion of  $H^+$  and  $NH_4^+$  and the conservation of  $HCO_3^-$  as mechanisms for maintaining the pH of blood.

*Objective 13*

Compare the lungs, integument and alimentary canal as organs of excretion that help maintain blood pH.

*Objective 14*

Describe the overall purpose of the countercurrent multiplier mechanism.

*Objective 15*

Identify the effects of blood pressure, blood concentration, ambient temperature, diuretics and emotions upon urine production.

*Objective 16*

Identify the effects of blood pressure, blood concentration, ambient temperature, diuretics and emotions upon urine production. Identify the physical characteristics and normal chemical constituents of urine.

*Objective 17*

Define the following: albuminuria; glucosuria; hematuria; pyuria; ketonuria; casts; calculi

*Objective 18*

Describe the structure of the ureters, urinary bladder and urethra.

*Objective 19*

Describe the nervous control of micturition and identify the stimulus which usually initiates the micturition reflex.

*Objective 20*

Compare incontinence, retention and suppression.

*Objective 21*

Identify the causes of renal ptosis, gout, glomerulonephritis, pyelitis and cystitis.

*Objective 22*

Describe the principles of hemodialysis.

*Objective 23*

Define the medical terminology associated with the urinary system.

*Objective 24*

Identify the avenues and/or predisposing causes of urinary tract infection.

*Objective 25*

Define the following: midstream (clean catch) urine sample.

*Objective 26*

Discuss the rationale for quantitating microorganisms for a routine urine culture.

*Objective 27*

Describe the precautions to take to prevent undue growth of contaminating organisms in a specimen collected for a urine culture.

*Objective 28*

Define body fluid and contrast intracellular versus extracellular fluid.

*Objective 29*

Select the avenues available for fluid intake and output.

*Objective 30*

Describe the mechanisms which regulate fluid intake and output.

*Objective 31*

Describe three functions of electrolytes.

*Objective 32*

Identify the overall importance of measuring concentration of anions, cations and electrolytes in milliequivalents per liter.

*Objective 33*

Compare the electrolyte concentration of plasma, interstitial and intracellular fluid.

*Objective 34*

Identify the four pressures upon which depend movements of fluids between plasma and interstitial space and determine whether the net movement of fluid is into or out of the capillary.

*Objective 35*

Define edema.

*Objective 36*

Identify the role of buffers, respiration and kidneys in maintaining the body's acid/base balance.

*Objective 37*

Define acidosis and alkalosis.

*Objective 38*

Distinguish between respiratory and metabolic alkalosis and acidosis.

*Module 15 – Digestive System*

The digestive system is vitally related to overall body health and well-being. Abnormalities in structure and/or function of the system have detrimental effect on all other body functions. The principles of chemistry studied during earlier modules will be applied on a wider scale in the section on nutrition and metabolism. Because the digestive system is the portal of entry and/or exit for many pathogenic microorganisms, some basic information on microbiology of the digestive tract will also be treated.

*Objective 1*

Describe digestion as a chemical and mechanical process.

*Objective 2*

Describe the structure of the wall of the alimentary canal.

*Objective 3*

Define the mesentery, lesser omentum and greater omentum as extensions of the peritoneum.

*Objective 4*

Describe the role of the mouth in digestion.

*Objective 5*

Describe the role of the tongue in digestion.

*Objective 6*

Identify the location of the salivary glands.

*Objective 7*

Define the function of saliva and salivary amylase in digestion.

*Objective 8*

Identify the mechanisms which regulate the secretion saliva.

*Objective 9*

Given the diagram, identify the parts of a typical tooth.

*Objective 10*

Compare the number and time of eruption of deciduous and permanent dentitions.

*Objective 11*

Describe the events involved in swallowing that close off the entry to the nasopharynx and the larynx.

*Objective 12*

Identify the anatomical features of the stomach.

*Objective 13*

Define rugae.

*Objective 14*

Describe the chief components of gastric juice.

*Objective 15*

Describe the overall factors which control the secretion of gastric juice.

*Objective 16*

Identify the general location of the pancreas.

*Objective 17*

Describe pancreatic juice and the function of pancreatic amylase, trypsin and pancreatic lipase.

*Objective 18*

Describe the general anatomy of the liver including the common hepatic duct, cystic duct, common bile duct and the hepatopancreatic ampulla.

*Objective 19*

Describe the functional anatomical units (lobules) of the liver.

*Objective 20*

Describe the function of bile and the role of the gall bladder in digestion.

*Objective 21*

List the non-digestive functions of the liver.

*Objective 22*

Identify the structural features of the small intestine that adapt it for digestion and absorption.

*Objective 23*

Describe the digestive enzymes in intestinal juice which reduce carbohydrates and proteins to their final products and identify these final products.

*Objective 24*

Identify the major mechanical movements of the small intestine.

*Objective 25*

Describe those structures of the large intestine that adapt it for absorption for feces formation and elimination.

*Objective 26*

Describe those structures of the large intestine that adapt it for absorption for feces formation and elimination.

*Objective 27*

Describe the major processes involved in feces formation.

*Objective 28*

Identify the set of reflexes which bring about defecation.

*Objective 29*

Describe the following: dental caries; periodontal disease; peritonitis; peptic ulcer; appendicitis; tumors; diverticulitis; cirrhosis; generalized hepatitis; gall stones; anorexia nervosa; bulimia

*Objective 30*

Define the medical terminology associated with the digestive system.

*Module 16 – Metabolism*

*Objective 1*

Define a nutrient, metabolism catabolism oxidation/reduction and anabolism.

*Objective 2*

Describe the fate of glucose as it is metabolized during glycolysis, the Krebs cycle and electron transport.

*Objective 3*

Summarize the net ATP production as a result of cellular respiration.

*Objective 4*

Define the following: glycogenesis; glycogenolysis; gluconeogenesis

*Objective 5*

Describe the general metabolic fate of lipids.

*Objective 6*

Describe fat storage in adipose tissue, including common sites and fat turnover.

*Objective 7*

Define the following: beta oxidation; ketogenesis; ketosis; lipogenesis

*Objective 8*

Describe the general metabolic fate of protein.

*Objective 9*

Define the following: deamination; essential A A 's; non-essential A A 's; transmission

*Objective 10*

Describe the importance of acetyl coenzyme A in the metabolism of carbohydrates.

*Objective 11*

Summarize the interrelationships among the carbohydrates, fats and proteins during metabolism.

*Objective 12*

Describe the role of the control of metabolism played by the following: insulin; glucagon; HGH; cortisol; thyroxine; epinephrine; testosterone; progesterone  
insulin; glucagon; HGH; cortisol; thyroxine; epinephrine; testosterone; progesterone

*Objective 13*

Define the chief role of minerals (as a group) in metabolism.

*Objective 14*

Define a vitamin; differentiate between the fat-soluble and water-soluble vitamins.

*Objective 15*

Identify the overall function in the body of vitamins A, D, K and C.

*Objective 16*

Identify the deficiency symptoms of vitamins D, D, K, C niacin, folic acid, thiamine (B<sub>1</sub>) and B<sub>12</sub>.

*Objective 17*

Define the causes and treatment of obesity.

*Objective 18*

Define phenylketonuria, cystic fibrosis, and celiac disease as disorders related to faulty metabolism.

*Objective 19*

Identify at what age an infant begins to have a resident intestinal flora.

*Objective 20*

Select the region in the GI tract of least and/or greatest microbial population.

*Objective 21 and 22*

Identify one important benefit obtained from the *E. coli* of the intestine. Identify the organism that presence in water is taken as an evidence of fecal contamination.

*Objective 23*

Identify the part of the body where *E. coli* is the most commonly found pathogen.

*Objective 24*

Describe the four modes of transmission of enteric pathogens from the GI tract and the recommended control measure for each.

*Objective 25*

Describe the diseases caused by salmonella and contrast salmonella food poisoning, botulism and staphylococcal food poisoning.

*Objective 26*

Describe the diseases caused by each of the below listed microorganisms:  
*Shigella; Vibrio cholerae; Brucella; Giardia lamblia*

*Objective 27*

Identify common entero viruses and describe the major symptom of amebic dysentery.

*Objective 28*

Identify the prominent characteristic symptoms, the mode of infection, and the infective stage for each of the below-listed worm infestations:

Pinworm; ascariasis; trichinosis; tapeworm

*Module 17 – Muscular System*

Our muscles and bones act as a unit to enable us to walk, dance, swim and talk. After we study the special structure and properties of muscles which allow them to apply the forces to move body parts, we will look at some relevant physical principles to help us understand these forces. A brief treatment of a few of the abnormal conditions which can paralyze movement will help us understand what is meant by the interdependence of many systems to perform any body functions

*Objective 1*

Define each of the functions of muscular tissue and the identifying characteristics of a muscle tissue.

*Objective 2*

Compare the general location, microscopic appearance, control and functions of the four specific kinds of muscle tissue.

*Objective 3*

Define the connective tissue components of skeletal muscle as well as their mode of attachment to the bone.

*Objective 4*

Cite the relationship of blood vessels, nerves and nerve fibers to skeletal muscles.

*Objective 5*

Define or identify on a diagram, the microscopic features of the skeletal muscle cell (fiber).

*Objective 6*

Select the name of the proteins which compose the thick and thin myofilaments.

*Objective 7*

Describe the sliding-filament theory of muscle contraction.

*Objective 8*

Select the role of each of the following structures in muscle contraction: motor neuron; neuromuscular junction; motor end plate; acetylcholine; motor unit

*Objective 9*

Identify the relationship between muscular precision and the number of muscle fibers per motor unit.

*Objective 10*

The study of physiology of muscle contractions, select the specific role played in muscle fiber at ATP, myosin, action calcium and troponin.

*Objective 11*

Describe the chemical reaction which is immediately responsible for supplying the energy for body heat and muscular contraction and describe the role of phosphocreatine.

*Objective 12*

According to the all-or-none principle of muscle contractions, identify the effect of both liminal and subliminal stimuli.

*Objective 13*

Define the kinds of normal muscle contraction.

*Objective 14*

Describe the role of muscle tissue in homeostasis.

*Objective 15*

Define “recovery oxygen consumption” (oxygen debt), and identify the relationship between normal body temperature and muscular activity.

*Objective 16*

Define the cause and characteristics of the following muscular disorders: fatigue; fibrosis; muscular dystrophy; myasthenia gravis.

*Objective 17*

Select the symptoms which accompany the following types of abnormal muscle conditions: spasm; cramp, convulsion, and fibrillation

*Objective 18*

Define the medical terminology associated with the muscular system.

*Objective 19*

Define the terms “origin” and “insertion” as applied to muscles and identify the origin and insertion of the biceps muscle.

*Objective 20*

Identify the fulcrum, lever, resistance, and effort in the skeletal muscular activity of a) picking up a snowball with a gloved hand and b) stepping up with a ski boot and ski on your foot.

*Objectives 21 and 22*

Define or identify on a diagram: 1<sup>st</sup> class, 2<sup>nd</sup> class and 3<sup>rd</sup> class levers. Identify an example of each kind of lever in the muscular system of the body.

*Objective 23*

Explain the role of prime movers (agonist), antagonists and synergists in producing normal body movements, and identify the muscles involved in each role when one flexes the forearm.

*Objective 24*

Identify the particular criterion used to name each of the following muscles: tibialis anterior; triceps; transversus abdominis; gluteus maximus; biceps; rectus abdominis; stylohyoid

*Objective 25*

Identify on a diagram the location of each of the following skeletal muscles: biceps brachii; triceps brachii; sternocleidomastoid; trapezius; deltoid; pectoralis major; diaphragm; latissimus dorsi; gastrocnemius; gluteus maximus; hamstrings; quadriceps

*Objective 26*

Name the four muscles composing the anterior abdominal wall.

*Objective 27*

Identify the common routes of injection.

*Objective 28*

Identify three muscles commonly chosen as sites for intramuscular injection and select a reason for the choice of these muscles.

*Objective 29*

Identify the major characteristics of the organisms belonging to the genus *Clostridium*.

*Objective 30*

Identify the cause, result and mechanism of action of the muscle related diseases.

*Objective 31*

Define the following terms: force, scalar quantity; vector quantity; concurrent forces; resultant force; torque; center of gravity; density; specific gravity

*Objective 32*

Select the statement which describes muscle action in terms of vector addition.

*Objective 33*

Given two concurrent forces find the resultant force using the geometric method.

*Objective 34*

Cite the location of the center of mass (gravity) and the base of a person standing upright.

*Objective 35*

Select the correct body mechanics to use for lifting a heavy object.

*Objective 36*

Explain the reason for the apparent loss of weight when a object is suspended in water.

*Objective 37*

Given the numerical expression of the specific gravity of a solution, compare its density to that of pure water.

*Module 18 – Skeletal System*

Relevant principles of chemistry, physics and microbiology will be integrated into the study of the skeletal system. With such terms as organic, inorganic, molecule, matrix, ion, cocci, infection, carrier, etc. Being a part of the vocabulary the study of this system will be enriched by pertinent applications of principles from the basic sciences.

*Objective 1*

Identify the five major functions of the skeletal system.

*Objective 2*

Compare the two kinds of tissue of the skeletal system (bone and cartilage) as to the amount and kind of matrix and relative blood supply.

*Objective 3*

Identify the major inorganic and organic constituents of the bone matrix.

*Objective 4*

Define the structural and functional features of a typical long bone.

*Objective 5*

Compare the structural features of compact vs spongy bone.

*Objective 6*

Describe the important feature of two types of ossification and indicate what parts of the skeleton are formed by these two types of ossification.

*Objective 7*

Compare the functions of articular cartilage and epiphyseal plate.

*Objective 8*

Identify the respective roles of osteoblasts, osteocytes and osteoclasts in the growth of bones.

*Objective 9*

Identify the age at which bone ossification is usually completed.

*Objective 10*

Identify the role in bone homeostasis played by hormones and Vitamin D.

*Objective 11*

Given a description of any bone disorders listed below, identify the name of the disorder: osteomyelitis; osteomalacia; rickets; osteoporosis; Paget's disease.

*Objective 12*

List the main types of fractures most commonly found in the body and identify the major steps involved in healing of fractures.

*Objective 13*

Define the terms: metastasis; sarcoma; myeloma and chondrosarcoma; tumor

*Objective 14*

Distinguish the characteristics of a benign vs malignant tumor.

*Objective 15*

Select three diseases/disorders caused by *Staphylococcus aureus* and describe and define them.

*Objective 16*

Identify any three of the five groups of patients who are highly susceptible to infection by staphylococcal organisms.

*Objective 17*

Identify three ways in which hospital personnel can help to prevent the emergence of drug-resistant staphylococci.

*Objective 18*

Identify the classes of bones and the characteristics of each class.

*Objective 19*

Define the following bone markings: foramen; meatus; sinus; fossa; condyle; tuberosity.

*Objective 20*

Define the terms "suture" and "fontanel."

*Objective 21*

Identify the major groups of bones which belong to the axial skeleton and to the appendicular skeleton.

*Objective 22*

Given a diagram of the skull, locate the following bones: mandible; maxilla; zygomatic bone; frontal bone; parietal bone; occipital bone; sphenoid bone; ethmoid bone; hyoid bone; mastoid process of the temporal bone

*Objective 23*

Identify the important functions of the perineocele sinus.

*Objective 24*

Identify the general number, location and curves associated with each of the five groups of vertebrae.

*Objective 25*

Distinguish between the vertebral foramina and the intervertebral foramina.

*Objective 26*

Distinguish the following spinal abnormalities: scoliosis; kyphosis; lordosis

*Objective 27*

Locate the following bones: floating ribs; false ribs; carpals; metacarpals; tarsals; metatarsals; phalanges

*Objective 28*

Identify the most frequent cause of flat feet.

*Objective 29*

Identify the major differences between the male and female skeleton.

*Objective 30*

Describe the functional classifications of joints.

*Objective 31*

Describe the structural classification of joints.

*Objective 32*

Define a ligament and its role in a synovial joint.

*Objective 33*

Given a diagram of a joint extension, flexion, abduction, or adduction identifies the name of the movement.

*Objective 34*

Describe the following bone disorders: herniated disk; spina bifida; fractures of vertebral column; osteoarthritis; gouty arthritis; bursitis

*Objective 35*

Identify the underlying principles involved in the following procedures: radiography, radiographic, diagnosis of tumors; angiography.

*Objective 36*

Identify the fundamental problems involved in treating tumors with x-radiation.

*Module 19 – Integumentary System*

*Objective 1*

List the parts that make up integumentary system and describe the overall function of that system.

*Objective 2*

Select the major layer of the skin which consists of: stratified squamous epithelium; blood vessels, nerve fibers and sensory receptors; areolar and adipose connective tissue; and connects the skin to the outer layer of skeletal muscles.

*Objective 3*

Identify the fundamental difference between the stratum germinativum and the stratum corneum of the skin epidermis.

*Objective 4*

List the structures that are epidermal derivatives.

*Objective 5*

Select the structures responsible for the continual formation of hair and nails.

*Objective 6*

Identify the functions of the two types of glands: sudoriferous and sebaceous.

*Objective 7*

Explain how each of the following structures helps the integumentary system to perform its important task of regulating body temperature.

*Objective 8*

Given the specific body surface involved use the “rule of times” to estimate the percentage of body surface that hasn’t been burned.

*Objective 9*

Identify the two general areas of the skin which have the most numerous normal flora.

*Objective 10 and 11*

Given a description, identify some common diseases of the skin and define some common medical terms associated with the skin.

*Objective 12*

List characteristics and examples of electromagnetic versus particle radiation.

*Objective 13*

List characteristics and examples of ionizing versus non-ionizing radiation.

*Objective 14*

Compare the energy and penetrating power of UV rays, x-rays and gamma rays.

*Objective 15*

Characterize the relative vulnerability of body tissues to ionizing radiation

*Objective 16*

Specify the most significant site at which cellular damage may occur following exposure to radiation.

*Objective 17*

List the symptoms and disorders that may be induced by UV and other forms of radiation.

*Objective 18*

Identify the age groups that are most sensitive to radiation.

## *Module 20 – Reproductive System*

Students who have completed this module of the course should be able to identify and describe the major gross and microscopic anatomical components of the reproductive system and explain their functional roles in reproduction and inheritance.

### *Objective 1*

Describe the anatomy of the gonads, ducts and accessory glands of the male system of reproduction (the genital organs).

### *Objective 2*

Describe the anatomy and role of the scrotum and spermatic cord in protecting the testes.

### *Objective 3*

Identify by name the cells of the testes that produce sperm, testosterone and nutrients.

### *Objective 4*

Identify the functions of testosterone in the male.

### *Objective 5*

Trace the course of spermatozoa through the system of ducts that lead from the testes to the exterior.

### *Objective 6*

Describe the location and general function of the seminal vesicle, prostate gland and bulbourethral glands.

### *Objective 7*

Describe the anatomy and physiology of the penis and its role as an organ of copulation.

### *Objective 8*

Describe the anatomy of the female genitalia.

### *Objective 9*

Identify the functions of the ovaries.

### *Objective 10*

Identify the functions of the uterine (fallopian) tubes.

### *Objective 11*

Identify the structures which support and anchor the ovaries and uterus in position.

### *Objective 12*

Describe how hypothalamic and pituitary cycles influence the reproductive cycling of the ovaries and uterus.

### *Objective 13*

Cite the physiological effects of estrogens, progesterone and relaxin.

### *Objective 14*

Describe the functions of the vagina.

### *Objective 15*

Identify the components of the vulva.

*Objective 16*

Cite the anatomical boundaries of the perineum.

*Objective 17*

Identify the hormones which play a role in the development of the mammary glands and cite the role played by each.

*Objective 18*

Identify the cause and/or the symptoms of the following: prostate disorders; impotency; infertility; menstrual abnormalities; amenorrhea; dysmenorrhea; abnormal uterine bleeding; PMS; TSS; endometriosis; cancer of the breast; cancer of the cervix.

*Objective 19*

Define the medical terminology associated with the reproductive system.

*Objective 20*

Contrast the general outcomes of mitosis vs. meiosis.

*Objective 21*

Contrast the general outcomes of spermatogenesis vs. oogenesis.

*Objective 22*

Identify the physiological events which are alike in the male and the female in sexual intercourse.

*Objective 23*

Describe the following events that occur during early human embryological development.

*Objective 24*

Describe the significance of primary germ layers, embryonic membranes, placenta and umbilical cord for the developing fetus.

*Objective 25*

Identify representative body structures produced by each of the primary germ layers.

*Objective 26*

Describe how the proper naming of malignancies is linked to primary germ layers.

*Objective 27*

Identify the principal events associated with the three stages of labor.

*Objective 28*

Define parturition and postpartum.

*Objective 29*

Describe the physiology of lactation, including hormonal control.

*Objective 30*

Define inheritance.

*Objective 31*

Describe the inheritance of gender, PKU and color blindness.

*Objective 32*

Define amniocentesis and its significance.

*Objective 33*

Identify the cause and symptoms of Down's syndrome.

*Objective 34*

Identify the mechanism of the following contraceptive methods: tubal ligation; vasectomy; oral contraceptives; Norplant; condom; diaphragm; spermicidal foam/jelly; IUD; rhythm method; coitus interruptus.

*Objective 35*

Contrast the failure rates of contraceptive methods under ideal use (as prescribed) versus actual use.

*Objective 36*

Describe the normal flora of the genital tract and the importance of lactobacilli in the vagina.

*Objective 37*

List the names and symptoms of common sexually transmitted infections (in the USA).

*Module 21 – Aging*

Aging is variable and complex. It is difficult to distinguish between normal aging and changes secondary to disease. The life span for humans seems to be a function of several factors; namely, heredity, culture, nutrition and environment. Total life span seems limited to 90 to 105 years which support the belief that aging is an inborn or innate process.

*Objective 1*

Describe the following cellular theories of aging: free radical theory; waste product theory; immunologic theory; cross-link theory; somatic mutation theory; genetic aging theory.

*Objective 2*

Identify the general effects of aging.

*Objective 3*

Describe changes in the nervous system associated with aging.

*Objective 4*

Describe changes that occur within the aging heart.

*Objective 5*

Describe changes in arteries and veins associated with aging.

*Objective 6*

Describe changes in the respiratory system associated with aging; indicate the respiratory consequences of stress.

*Objective 7*

Describe changes in the genitourinary system associated with aging.

*Objective 8*

Note the organisms that commonly cause bladder infections in the elderly.

*Objective 9*

Describe changes in the endocrine system associated with aging.

*Objective 10*

Describe changes in the digestive system associated with aging.

*Objective 11*

Describe changes in the musculoskeletal system associated with aging.

*Objective 12*

Describe changes in the integumentary system associated with aging.

*Objective 13*

Describe changes in special and general senses associated with aging.

*Objective 14*

Identify chemical carcinogens and cancers that are more common in the elderly than in the younger populations.

*Objective 15*

Discuss the changes associated with aging that cause alterations in drug metabolism; identify some toxic effects of drugs in the elderly.