

UNIT 1 – BODY PLAN AND ORGANIZATION

STANDARDS AND OBJECTIVES

STANDARD

01 Students will explore careers in health care and describe the body plan and organization and homeostasis.

OBJECTIVES

01.01 Students will explore careers in health care.

- **Students will participate in a minimum of three career exploration experiences to investigate a variety of health care careers related to therapeutic services, diagnostic services, health informatics, support services, and biomedical research and development pathways.**

01.02 Students will provide an oral and/or written report for each career exploration utilizing the report outline located in the MAP curriculum.

Note: Electronically delivered career exploration experiences are permissible.

01.03 Students will select a topic and defend their position on a current medical ethical dilemma.

01.04 Contrast the sciences of anatomy and physiology.

01.05 Describe the six levels of structural organization of the human body.
(chemical, cellular, tissue, organ, system, organism)

01.06 Describe metabolism and its anabolic and catabolic processes.

01.07 Apply directional terms used in human anatomy.
(posterior/anterior, medial/lateral, proximal/distal, superficial/deep, superior/inferior)

01.08 Apply commonly used planes to divide the body.
(sagittal, midsagittal, transverse [horizontal], frontal [coronal])

01.09 Identify the body cavities and locate the following organs within each cavity.

- Dorsal Cavity
 - Vertebral - spinal cord
 - Cranial - brain
- Ventral Cavity
 - Thoracic – heart, lungs
 - Mediastinum - heart, bronchi, esophagus, thymus
 - Pericardial - heart
 - Pleural - lungs
- Abdominopelvic Cavity - liver, spleen, intestines, kidneys, stomach
- Pelvic - intestines, urinary bladder, sex organs

01.10 Identify the major organ(s) in each abdominal quadrant.

- RUQ - right upper quadrant - liver, gallbladder, right kidney
- RLQ - right lower quadrant – cecum, appendix, right ovary
- LUQ - left upper quadrant - spleen, stomach, left kidney
- LLQ - left lower quadrant - left ovary

01.11 Examine the relationship between homeostasis and stress.

01.12 Differentiate between negative and positive feedback mechanisms.

UNIT 2 - BASIC PRINCIPLES OF BODY CHEMISTRY

STANDARDS AND OBJECTIVES

STANDARD

02 Students will explain basic principles of body chemistry.

OBJECTIVES

- 02.01 Review the following terms and concepts.
(states of matter, elements, basic components of the atom [nucleus, electrons, protons, and neutrons], ion [electrolyte])
- 02.02 Identify the four major elements in the body.
(carbon, hydrogen, oxygen, nitrogen)
- 02.03 Differentiate between a compound and a molecule.
- 02.04 Differentiate between a cation and an anion.
- 02.05 Describe the characteristics of ionic, covalent, and hydrogen bonds.
- 02.06 Define pH.
- 02.07 Categorize acidic, basic, or neutral solutions based on the pH of a solution.
- 02.08 Distinguish between “neutral” pH and the “average” pH range of the blood.
(neutral pH = 7.0, average pH of blood = 7.35 to 7.45)
- 02.09 Describe the properties of water and how it is utilized in the human body.
(universal solvent, transport, lubricant, heat capacity, chemical reactions)
- 02.10 Distinguish between inorganic and organic compounds.
(Inorganic compounds do not contain carbon, are small molecules, and usually form ionic bonds. Organic compounds usually contain carbon, are large molecules, form covalent bonds, and flammable)
- 02.11 Describe the structures and functions of carbohydrates, proteins, lipids, and nucleic acids.
- 02.12 Describe how the body produces energy during cellular respiration.
($\text{ATP} \leftrightarrow \text{ADP} + \text{P} + \text{ENERGY}$)

UNIT 3 - CELLS, HISTOLOGY, INTEGUMENTARY SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

03 Students will describe basic concepts of structures and functions of cells, histology, and the integumentary system.

OBJECTIVES

- 03.01 Identify the four principle parts of a generalized animal cell and their functions. (nucleus, cytosol, organelles & cell membrane)
- 03.02 Describe the structure and function of the cell membrane.
- 03.03 Describe a selectively permeable membrane and factors which influence permeability.
- 03.04 Contrast intracellular and extracellular fluid in terms of location and composition.
- 03.05 Describe each of the following cellular transport processes and classify them as active or passive. (Passive processes – diffusion, osmosis, facilitated diffusion, dialysis, and filtration. Active processes -- phagocytosis, exocytosis and active transport)
- 03.06 Review the osmotic effects that occur when a cell is placed in an isotonic, hypotonic, or hypertonic solution.
- 03.07 Describe the function of the following structures within the cell. (nucleolus, gene, chromatin, chromosome, DNA, ribosomes, endoplasmic reticulum, Golgi complex, mitochondria, lysosomes, vacuole, peroxisomes, microfilaments, microtubules, centrioles, centrosomes, flagella, cilia, microvilli)
- 03.08 Compare and contrast mitosis and meiosis.
- 03.09 Identify the general characteristics and functions of each of the four principle types of tissues. (Epithelial - strategies for tissue identification [arrangement & cell shape]; Connective - adipose, cartilage, dense fibrous, blood, bone; Muscular - skeletal, smooth, cardiac; and Nervous)
- 03.10 Contrast exocrine and endocrine glands.
- 03.11 Differentiate between the four basic types of membranes. (mucous, serous, synovial, cutaneous)

- 03.12 Describe the structures and functions of the integumentary system components.
(skin, glands, hair, nails)
- 03.13 Describe the major layers of skin.
(epidermis, dermis, subcutaneous [hypodermis])
- 03.14 Describe the functions of sudoriferous (sweat) and sebaceous (oil) glands.
- 03.15 Identify the following diseases or disorders of the integumentary system.
(acne, skin cancers [basal cell carcinoma, squamous cell carcinoma, malignant melanoma], decubitus ulcers)

UNIT 4 - SKELETAL SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

04 Students will describe the structures and functions of the skeletal system and its components.

OBJECTIVES

- 04.01 Identify the general functions of the skeletal system.
- 04.02 Identify the roles of the osteoblasts, osteocytes, and osteoclasts in bone growth and ossification.
- 04.03 Describe the features of a long bone.
(periosteum, diaphysis, epiphysis, medullary cavity, red marrow, yellow marrow, articular cartilage, endosteum, compact bone, spongy bone)
- 04.04 Identify the four shapes of bones with characteristics and examples of each.
(long, short, flat, irregular)
- 04.05 Describe and locate the following bone markings.
(foramen, meatus, sinus, fossa, condyle, tuberosity, trochanter, tubercle, process)
- 04.06 Describe the terms “suture” and “fontanel”.
- 04.07 Contrast the axial and appendicular skeletons.
- 04.08 Locate the following skull bones.
(mandible, maxilla, zygomatic, frontal, parietal, occipital, sphenoid, ethmoid, hyoid, temporal, mastoid process)
- 04.09 Contrast the average number, location and function of each of the five groups of vertebrae.
- 04.10 Explain the structural classifications of articulations.
(fibrous, synovial & cartilaginous)
- 04.11 Differentiate between ligaments and tendons.
- 04.12 Identify the following diseases or disorders of the skeletal system.
(herniated disk, osteoarthritis, osteoporosis, scoliosis, spina bifida)

UNIT 5 - MUSCULAR SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

05 Students will describe the structures and functions of the muscular system and its components.

OBJECTIVES

- 05.01 Identify the general functions of the muscular system.
- 05.02 Describe the four characteristics of muscle tissue.
(elasticity, excitability [irritability], extensibility, flexibility)
- 05.03 Contrast the general location, microscopic appearance, control, and functions of the three specific types of muscle tissue. (skeletal, smooth, cardiac)
- 05.04 Contrast thick and thin myofilaments.
- 05.05 Describe the sliding-filament theory of muscle contraction.
- 05.06 Describe what occurs at the neuromuscular junction.
- 05.07 Define the terms “origin” and “insertion.”
- 05.08 Explain the role of prime movers (agonists), antagonists, synergists, and fixators.
- 05.09 Describe the locations and functions of the following skeletal muscles:
(biceps brachii, triceps brachii, sternocleidomastoid, trapezius, deltoid, diaphragm, pectoralis major, latissimus dorsi, gastrocnemius, hamstrings, quadriceps, gluteus maximus)
- 05.10 Identify the following diseases and disorders of the muscular system.
(fibromyalgia, muscular dystrophy, shin splints)

UNIT 6 - NERVOUS SYSTEM / SPECIAL SENSES

STANDARDS AND OBJECTIVES

STANDARD

05 Students will describe the structures and functions of the nervous system and special senses.

OBJECTIVES

- 06.01 Restate the three broad functions of the nervous system:
(sensory, integration, motor)
- 06.02 Describe the general organization of the nervous system.
- 06.03 List the functions and structures of neurons and neuroglial cells:
(astrocytes, microglia, oligodendrocytes, ependymal cells, Schwann cells)
- 06.04 Sequence the major events when the nerve impulse (action potential) is initiated and transmitted through a neuron.
- 06.05 Contrast white and gray matter of nervous tissue.
- 06.06 Identify the structures responsible for the maintenance and protection of the central nervous system. (meninges [dura mater, arachnoid mater and pia mater])
- 06.07 Explain the role of each of the components of a reflex arc.
(reflex, reflex arc, receptor, sensory neuron, association [interneuron] neuron, motor neuron, effector)
- 06.08 Identify the four principle parts of the brain.
(cerebrum, cerebellum, brain stem, diencephalon)
- 06.09 Describe the location, and function of CSF.
(ventricles, subarachnoid space)
- 06.10 Describe the functions of the three structures of the brain stem.
(medulla oblongata, pons, midbrain)
- 06.11 Describe the structures and functions of the diencephalon.
(thalamus, hypothalamus)
- 06.12 Describe the locations and functions of the four lobes of the cerebrum.
(frontal, parietal, temporal, occipital)
- 06.13 Explain the major functions of the cerebellum.

- 06.14 Identify the following diseases or disorders of the nervous system.
(ALS, Alzheimer's, bacterial meningitis, cerebral palsy, epilepsy, multiple sclerosis, Parkinson's)
- 06.15 Describe the principle anatomical structures of the eye.
(accessory structures [eyelid, conjunctiva, lacrimal apparatus, extrinsic muscles] layers of the eyeball (fibrous tunic [sclera, cornea], vascular tunic [choroid, ciliary body, iris, lens, pupil], nervous tunic [retina])
- 06.16 Describe the principle anatomical structures of the ear.
(outer ear [auricle, auditory canal], middle ear [tympanic cavity, tympanic membrane, auditory (Eustachian) tube, auditory ossicles (malleus, incus, stapes)], inner ear [bony labyrinth, membranous labyrinth, semicircular canals, vestibule, cochlea, Organ of Corti])
- 06.17 Identify the following diseases or disorders associated with special senses.
(presbyopia, myopia, hyperopia, cataracts, conjunctivitis, deafness [conductive, sensorineural], glaucoma, macular degeneration, middle ear infection, strabismus, tinnitus, vertigo)

UNIT 7 - ENDOCRINE SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

06 Students will describe the structures and functions associated with the endocrine system.

OBJECTIVES

07.01 Identify the general functions of the endocrine system.

07.02 Describe a “hormone” and how it functions in the body.

07.03 Describe the locations, secretions, and functions of the major endocrine glands.
(pituitary gland [GH, TSH, ACTH], thyroid gland [thyroxine], adrenals [epinephrine, norepinephrine, cortisol, pancreas [glucagon, insulin])

07.04 Identify the following diseases or disorders of the endocrine system.
(acromegaly, cretinism, diabetes mellitus, dwarfism, gigantism, hyperthyroidism, hypothyroidism, myxedema)

UNIT 8 - BLOOD / LYMPHATIC / CARDIOVASCULAR SYSTEMS

STANDARDS AND OBJECTIVES

STANDARD

08 Students will describe the components and functions associated with blood, and the structures and functions of the lymphatic and cardiovascular systems.

OBJECTIVES

- 08.01 Identify the components of blood and their functions.
(erythrocytes, leukocytes, thrombocytes, plasma)
- 08.02 Describe erythrocytes, including the structure of hemoglobin.
- 08.03 Define “leukocyte” and list the two major groups with their cell types.
(granulocytes – neutrophils, basophils, eosinophils, and agranulocytes – monocytes, lymphocytes)
- 08.04 Describe the process of hemostasis.
(vascular spasm, platelet plug formation, coagulation)
- 08.05 Contrast a thrombus and an embolus.
- 08.06 Identify the antigens found on the erythrocytes and the antibodies that determine the ABO blood types and the Rh factor.
- 08.07 Identify the following diseases or disorders associated with the blood.
(anemias, hemolytic disease of the newborn, hemophilia, leukemia, mononucleosis, polycythemia)
- 08.08 Identify the components of the lymphatic system.
(tonsils, spleen, thymus, lymph nodes, bone marrow, lymph vessels)
- 08.09 Describe how lymph is moved through the body.
- 08.10 Contrast antigens and antibodies.
- 08.11 Describe the general roles of T-cells and B-cells in the immune response.
- 08.12 Distinguish between active and passive immunity, and natural vs. artificial acquisition of immunity.
- 08.13 Identify the following diseases or disorders associated with the lymphatic system.
(AIDS, measles, mumps, rubella, tetanus)
- 08.14 List the general functions of the cardiovascular system.

- 08.15 Describe the layers of the heart.
(epicardium, myocardium, endocardium)
- 08.16 Identify the chambers of the heart.
- 08.17 Locate the great blood vessels of the heart.
(superior vena cava, inferior vena cava, pulmonary trunk, pulmonary arteries, pulmonary veins, aorta, branches of the aorta)
- 08.18 Identify the valves of the heart.
(tricuspid, pulmonary semilunar, bicuspid (mitral), aortic semilunar)
- 08.19 Trace blood flow through the heart.
- 08.20 Identify the components of the conduction system of the heart and trace the pathway. (SA node, AV node, AV bundle, bundle branches, Purkinje fibers [conduction], fibers)
- 08.21 Sequence the principle events of the cardiac cycle in terms of systole and diastole.
- 08.22 Define cardiac output and identify factors that influence it.
(heart rate and stroke volume)
- 08.23 Contrast the structures and functions of arteries, capillaries, and veins.
- 08.24 Define pulse and identify the general location of arteries where pulse may be felt.
- 08.25 Describe blood pressure and how to measure it.
- 08.26 Contrast pulmonary and systemic circulation.
- 08.27 Identify the following diseases or disorders of the cardiovascular system.
(aneurysm, arteriosclerosis, atherosclerosis, cerebrovascular accident/stroke, coronary artery disease, hypertension, murmur, myocardial infarction)

UNIT 9 - Respiratory System

STANDARDS AND OBJECTIVES

STANDARD

09 Students will describe the structures and functions associated with the respiratory system.

OBJECTIVES

- 09.01 Identify the general functions of the respiratory system.
- 09.02 Sequence the organs of the respiratory system in the order which air will pass through them from the exterior. (nose or mouth, pharynx, larynx, trachea, bronchi, bronchioles, alveolar duct, alveoli).
- 09.03 Identify the three regions of the pharynx.
(nasopharynx, oropharynx and laryngopharynx)
- 09.04 Identify the following anatomical features of the larynx.
(epiglottis, glottis, hyoid bone, thyroid cartilage, cricoid cartilage, true and false vocal cords)
- 09.05 Identify the coverings of the lungs and the gross anatomical features of the lungs.
(apex, base, lobes, visceral pleura, parietal pleura, pleural cavity)
- 09.06 Identify the site at which gas exchange occurs in the lungs. (alveoli)
- 09.07 Identify the volumes and capacities of air exchanged during ventilation.
(tidal volume, vital capacity)
- 09.08 Differentiate between ventilation, external respiration, and internal respiration.
- 09.09 Describe the effects of carbon dioxide on ventilation.
- 09.10 Identify the following diseases or disorders of the respiratory system.
(emphysema, influenza, lung cancer, pneumonia, SIDS, tuberculosis)

UNIT 10 - DIGESTIVE SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

10 Students will describe the structures and functions associated with the digestive system.

OBJECTIVES

- 10.01 Identify the general functions of the digestive system.
- 10.02 Contrast chemical and mechanical digestion.
- 10.03 Differentiate between the alimentary canal structures (mouth, pharynx, esophagus, stomach, small intestines, large intestines, rectum, anus) and the accessory structures (salivary glands [parotid], pancreas, gallbladder, liver).
- 10.04 Describe the functions of saliva and salivary amylase in digestion.
- 10.05 Identify the following parts of a typical tooth.
(crown, neck, root, gingiva, periodontal ligament, enamel, dentin, pulp, root canal)
- 10.06 Define deglutition, mastication, maceration, segmentation, peristalsis and haustral churning.
- 10.07 Identify the anatomical features of the stomach.
(fundus, body, pylorus, rugae, cardiac sphincter, pyloric sphincter).
- 10.08 Identify the basic components of gastric juice.
(pepsin, hydrochloric acid, and mucus)
- 10.09 Identify the location and digestive functions of the pancreas.
- 10.10 Describe the function of bile (emulsification).
- 10.11 Identify the three sections of the small intestine.
(duodenum, jejunum, ileum)
- 10.12 Identify the structures and sections of the large intestine.
(cecum, colon [ascending, transverse, descending, sigmoid], rectum, anal canal)
- 10.13 Identify the following diseases or disorders of the digestive system.
(appendicitis, cirrhosis, colorectal cancer, gallstones, hepatitis, obesity, ulcers)

UNIT 11 - URINARY SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

11 Students will describe the structures and functions associated with the urinary system.

OBJECTIVES

- 11.01 Identify the general functions of the urinary system.
- 11.02 Identify the four major organs of the urinary system.
(kidneys, ureters, bladder, urethra)
- 11.03 Identify the gross anatomy of the kidney.
(renal cortex, renal medulla, renal pyramids, renal pelvis)
- 11.04 Identify the microscopic structures of the nephron:
(renal corpuscle, glomerulus, glomerular [Bowman's] capsule, afferent arteriole, efferent arteriole), renal tubule (proximal convoluted tubule, descending limb, nephron loop, ascending limb, distal convoluted tubule and collecting duct) and peritubular capillaries.
- 11.05 Describe the three basic physiological processes and the structures involved in urine formation. (filtration, reabsorption, secretion)
- 11.06 Identify abnormal constituents of urine.
(glucose, ketones, erythrocytes, leukocytes, bilirubin, microbes)
- 11.07 Describe the methods of fluid intake (oral [liquid and solid], intravenous, metabolic) and output (micturition, voiding, sweat, feces, exhaled vapor).
- 11.08 Identify the following diseases or disorders associated with the urinary system.
(cystitis, diabetes insipidus, glomerulonephritis, incontinence, kidney stones, renal failure, urinary tract infections)

UNIT 12 - REPRODUCTIVE SYSTEM

STANDARDS AND OBJECTIVES

STANDARD

12 Students will describe the structures and functions associated with the reproductive system.

OBJECTIVES

- 12.01 Identify the general functions of the reproductive system.
- 12.02 Describe the anatomy of the male genitalia.
- 12.03 Identify the function of the testes.
- 12.04 Identify the functions of testosterone in the male.
- 12.05 Describe the anatomy of the female reproductive structures.
- 12.06 Identify the functions of the ovaries.
- 12.07 Identify the structures and functions of the uterine (Fallopian) tubes, including fimbriae and infundibulum.
- 12.08 Describe the structures and function of the uterus.
(perimetrium, myometrium, endometrium, fundus, cervix)
- 12.09 Define the menstrual cycle including the ovarian and uterine cycles and changes that occur during menopause.
- 12.10 Describe the physiological effects of estrogens, progesterone and relaxin.
- 12.11 Contrast the general outcomes of spermatogenesis vs. oogenesis.
- 12.12 Define the following sequence of events that occur during human development.
(fertilization, zygote, implantation, embryo, fetus)
- 12.13 Identify the principle events associated with the three stages of labor.
(Stage 1 - dilation and effacement, Stage 2 - delivery and birth, Stage 3 - placental expulsion)
- 12.14 Identify the following diseases or disorders of the reproductive system.
(reproductive cancers [breast, testicular, cervical, ovarian, prostate], endometriosis, impotence, Sexually Transmitted Infections – STI's [gonorrhea, syphilis, genital herpes, chlamydia, trichomoniasis, genital warts, HPV [Human Papilloma Virus])