

NAS 161-162 - Unit Behavioral Objectives

The following material lists the behavioral objectives which define the content of the NAS 161-162 courses. As stated in the syllabus, these objectives define what is to be mastered and on what materials the student will be tested. The resources for mastering these objectives include text readings, laboratory exercises, lab manual and text diagrams, instructor-provided handouts and study guides, LRC and on-line reference materials, and class lecture notes. It is the student's responsibility to utilize any and all of those resources to master the objectives. Students will be required to spell all terms correctly.

NAS 161 – Health Science I

UNIT 1 – Introduction to Body Organization, Anatomical and Positional Terminology and Homeostasis.

Having completed the unit this student will be able to:

1. Define ANATOMY and PHYSIOLOGY and their subdivisions.
2. List and describe the levels of structural organization of the body.
3. Give examples of the major organs and principle functions of the following organ systems:

Integumentary	Respiratory
Skeletal	Digestive
Muscular	Urinary
Nervous	Endocrine
Cardiovascular	Lymphatic
Reproductive	

4. Define, recognize and properly use the following:

Directional Terms

anterior/posterior	medial/lateral/intermediate
dorsal/ventral	proximal/distal
superior/inferior	superficial/deep

Sectional Planes

sagittal (midsagittal, parasagittal)
frontal (coronal)
transverse
oblique

Body Cavities

Dorsal Cavity
 cranial cavity
 vertebral (spinal) cavity
Ventral Cavity
 thoracic cavity

pleural cavities
pericardial cavity
mediastinum
abdominoplevic cavity
abdominal cavity
pelvic cavity

Abdominopelvic Regions & Quadrants

umbilical	hypochondriac
epigastric	lumbar
iliac	hypogastric (pubic)

5. Recognize and describe the “ANATOMICAL POSITION”.
6. Identify the locations of the following serous membranes: Pleurae, Pericardial, Peritoneal. Distinguish between their “parietal” and “visceral” layers.
7. Give the anatomical names of the major body regions and areas.
8. Define and describe the concept of HOMEOSTASIS.
9. Describe the components and operation of a feedback system. Define and differentiate between negative and positive feedback systems and give examples of both.

UNIT 2 – Chemical & Molecular Level of Organization

1. Define and differentiate between organic and inorganic compounds.
2. Describe and/ or define the following properties of water. Relate those properties to biological significance:
molecular structure, polar property, hydrogen bonds, solvent and suspending property, hydrolysis and dehydration synthesis, specific heat, heat of vaporization, and lubricating and shock absorbing properties.
3. Define ACID, BASE and SALT.
4. Define pH. Differentiate between strong and weak acids and bases on the basis of pH.
5. Define BUFFERS.
6. Describe the general molecular formula for carbohydrates. Differentiate among monosaccharides, disaccharides and polysaccharides and give examples of each.
7. Define and describe the physiological importance of each of the following carbohydrates: ribose, deoxyribose, glucose, fructose, galactose, sucrose, lactose, maltose, glycogen, starch, cellulose.
8. Identify the molecular building blocks and describe the important characteristics and physiological significance of the following types of lipids: triglycerides, phospholipids, steroids and eicosanoids. Describe some roles played by prostaglandins.
9. Differentiate between saturated and unsaturated fats on the basis of the molecular structure of the fatty acid molecules.

10. Identify the building block molecules of proteins. Describe their principle functional groups and how they form peptide bonds. Distinguish between essential and non-essential amino acids.
11. Describe the primary, secondary, tertiary and quaternary structure of protein molecules.
12. Identify by giving specific examples and short descriptions how proteins play the following roles in the body: structural, regulatory, contractile, immunological, transport and catalytic (enzymatic).
13. Describe how enzymes function. Identify/describe or define the following associated with enzymes: specificity, activation energy, enzyme active site, substrate, enzyme-substrate complex, products.
14. Identify 2 different nucleic acids found in cells. Briefly state the roles played by each.
15. Describe the components of nucleotides of DNA and RNA. Give some differences between the components and structure of DNA and RNA.
16. Give the structural components of ATP. Briefly describe its physiological significance.

UNIT 3 – Cellular Level of Organization

1. Define the term CELL as it relates to the organizational levels of the body.
2. Identify the principle parts or regions of the generalized animal cell.
3. Describe the fluid-mosaic model of the structure of the plasma membrane. Identify the major component molecules.
4. Define the term SELECTIVE PERMEABILITY and identify factors which determine membrane permeability.
5. Differentiate between active and passive processes as they relate to movement of materials into and out of cells.
6. Define DIFFUSION and explain how cells gain or lose substances by diffusion.
7. Describe FACILITATED DIFFUSION by using the entry of glucose into cells as a specific example.
8. Define OSMOSIS. Differentiate between ISOTONIC, HYPERTONIC and HYPOTONIC solutions.
9. Describe and explain the fate of human red blood cells when placed in isotonic, hypertonic and hypotonic solutions.
10. Define and give examples of FILTRATION.
11. Describe and give examples of ACTIVE TRANSPORT that involve membrane transporter proteins.
12. Define and differentiate between ENDOCYTOSIS and EXOCYTOSIS.
13. Define and give examples of PHAGOCYTOSIS and PINOCYTOSIS.
14. Describe the location, characteristics and general functions of the cell's CYTOSOL.
15. Identify and describe the functions of the following cell structures. Be able to identify them from a picture or diagram of a typical cell: Endoplasmic Reticulum (rough and smooth forms), Ribosomes, Golgi Complex, Mitochondria,

- Lysosomes, Peroxisomes, Proteasomes, Cytoskeleton Components, Centrioles, Cilia & Flagella, Vacuoles, Nucleus, Nuclear Envelope, Nucleolus, Chromatin.
16. Define and give examples of INTRACELLULAR INCLUSIONS and EXTRACELLULAR MATERIALS.
 17. Describe how new cells are created. Differentiate between the processes of and outcomes of MITOSIS and MEIOSIS.

UNIT 4 – Metabolism

1. Define METABOLISM. Differentiate between ANABOLISM and CATABOLISM. Relate ATP consumption and production to anabolic and catabolic metabolism.
2. Define OXIDATION and REDUCTION.
3. Define CELLULAR RESPIRATION. Give a simple balanced chemical reaction that depicts the reactants and products of cellular respiration. Identify the source of each of the reactants and the fates of each of the products.
4. Describe the processes of GLYCOLYSIS, KREB'S CYCLE and the ELECTRON TRANSPORT CHAIN as they relate to cellular respiration. Identify where in the cell each of the processes occur and which are aerobic and anaerobic. Describe the roles of Coenzyme A and NAD & FAD.
5. Summarize the net production of ATP in each of the stages of cellular respiration..
6. Describe the following processes associated with glucose metabolism: GLYCOGENESIS, LIPOGENESIS, GLYCOGENOLYSIS, GLUCONEOGENESIS.
7. Describe the importance of the following processes and terms associated with the metabolism of fats: LIPOPROTEINS, ADIPOSE TISSUE, LIPOLYSIS, GLYCEROL CATABOLISM, BETA-OXIDATION, KETOSIS.
8. Describe the importance of the following processes associated with the metabolism of proteins: Anabolism – PROTEIN SYNTHESIS; summarize the roles played by amino acids, DNA, RNA and ribosomes in protein synthesis. Relate protein synthesis with inherited characteristics. Catabolism – DEAMINATION of amino acids. Explain the possible fates of the products of deamination.
9. Differentiate between the ABSORPTIVE and POSTABSORPTIVE metabolic states. Describe the potential fates of glucose, fats and amino acids during each state. Relate the roles of INSULIN and GLUCAGON during each state.
10. Describe and define MINERALS and VITAMINS as micronutrients. Differentiate between water-soluble and fat-soluble vitamins.
11. Define METABOLIC RATE as it relates to heat production. Define CALORIE as it pertains to heat production and energy values of food. Give the normal internal body temperature ranges in degrees Fahrenheit and Celsius.
12. Describe what is meant by BASAL METABOLIC RATE. Identify factors and conditions that effect metabolic rate.
13. Describe means by which the body loses heat.
14. Describe the feedback systems involved in THERMOREGULATION.

UNIT 5 – Microbiology & Infectious Disease

1. Describe the distinguishing characteristics of viruses, Rickettsia, bacteria, protozoa and fungi.
2. Describe how viruses cause harm; what a provirus is; and describe some of the criteria used in classifying viruses.
3. Identify some of the criteria used in identifying, classifying and distinguishing among bacteria, Rickettsia, protozoa and fungi. Name some other microbial forms that can cause disease.
4. For given infectious diseases, identify the etiologic agents.
5. Define, describe and give examples of the following concepts related to infectious disease: pathogenicity, virulence, method of transmission, portal of entry, size of inoculum, and host resistance.
6. Define, describe and give examples of preventive measures, diagnostic procedures and treatment as applied to infectious disease.
7. Interpret a disease model for an infectious disease.
8. Define and correctly use all the listed vocabulary terms from the provided handout.

UNIT 6 – Tissue Level of Organization

1. Define TISSUE.
2. Identify and give the general functions of four principle groups of mature tissues.
3. Be able to give descriptions of the components and distinguishing characteristics and capabilities of each of the listed tissues. Also be able to give examples of organs or structures that contain each tissue. EPITHELIAL: simple squamous, stratified squamous, simple columnar (plain & ciliated), simple cuboidal, stratified cuboidal, transitional, and pseudostratified. CONNECTIVE: loose (areolar), adipose, dense (regular & irregular), elastic, reticular, cartilage (hyaline, fibro- and elastic), osseous, vascular. MUSCULAR: skeletal, smooth, cardiac. NERVOUS.
4. Distinguish between EXOCRINE and ENDOCRINE glands.
5. Give examples and locations of the following types of membranes: serous, mucous, cutaneous and synovial.
6. Describe the processes and stages involved in tissue/wound healing and repair. Identify those factors that affect the repair processes.

UNIT 7 – Integumentary System

1. Identify the organs and functions of the integumentary system.
2. Distinguish among the epidermis, dermis, and subcutaneous layers. Describe their positions and tissue compositions.
3. Describe the different strata and cells of the epidermis and describe how the epidermis grows and regenerates.
4. Define keratin and the process of keratinization.

5. Identify the factors that determine and effect skin color.
6. Identify and describe the two major regions of the dermis.
7. Describe the sensory functions of the skin. Name some of the dermal sensory receptors involved.
8. Identify the structures and functions associated with the hair and nails.
9. Identify the characteristics and functions of the following glands associated with the skin: sebaceous glands, eccrine & apocrine sudoriferous glands, ceruminous and mammary glands.
10. Describe the role of the skin in thermoregulation.
11. Distinguish among first, second and third degree burns.

UNIT 8 – Skeletal & Articular System

1. Describe the components and functions of the skeletal system. Define the term ARTICULATION.
2. Describe the structure, characteristics, capabilities and locations of compact and spongy osseous tissue.
3. Describe the roles played by OSTEOLASTS, OSTEOCYTES and OSTEONCYTES.
4. Name the major inorganic and organic components of bone matrix.
5. Describe and contrast INTRAMEMBRANOUS and ENDOCHONDRAL OSSIFICATION. Identify bones formed by each process. Describe the FONTANELS and EPIPHYSEAL PLATES.
6. Describe how each of the following determine and affect bone development, growth and maintenance: Calcium. Phosphorus, Protein, Vitamins D & C, human Growth Hormone, sex hormones (estrogen & testosterone), gravity and activity.
7. Describe how Parathyroid Hormone and Calcitonin and the bones are involved in the negative feedback control of blood Ca⁺⁺ levels.
8. Give examples of LONG, SHORT, FLAT and IRREGULAR bones. Give some other categories of bone classification.
9. Describe the anatomy and tissues associated with the generalized structure of a long bone.
10. Describe and distinguish between red and yellow marrow.
11. Distinguish between the axial and appendicular divisions of the skeleton.
12. Be able to locate and identify the following bones: frontal, parietal, occipital, temporal, sphenoid, ethmoid, maxilla, mandible, zygomatic, lacrimal, nasal, vomer, palatine, inferior nasal conchae, hyoid, cervical vertebrae, atlas, axis, thoracic vertebrae, lumbar vertebrae, sacrum, coccyx, sternum, vertebrosteral ribs, vertebrochondral ribs, vertebral ribs, clavicle, scapula, humerus, ulna, radius, carpals, metacarpals, phalanges, coxal, ilium, ischium, pubic, femur, patella, tibia, fibula, calcaneus, tarsals, metatarsals and phalanges.
13. Be able to identify the following landmarks on each of the listed bones:
 OCCIPITAL: foramen magnum, occipital condyles. TEMPORAL: external auditory meatus, zygomatic process, mastoid process. SPHENOID: sella turcica. ETHMOID: crista galli, cribriform plate, perpendicular plate. MANDIBLE: mandibular condyles, coronoid processes. VERTEBRA: spinous process,

- transverse processes, body, vertebral foramen. SCAPULA: spine, acromion, glenoid cavity, coracoid process. HUMERUS: head, medial and lateral epicondyles, trochlea. ULNA: trochlear notch, olecranon process. RADIUS: head. STERNUM: manubrium, body, xyphoid process. COXAL: acetabulum, obturator foramen. FEMUR: head, neck greater trochanter, medial & lateral condyles. TIBIA: tibial tuberosity, medial malleolus. FIBULA: lateral malleolus.
14. Locate and identify the sutures of the cranium.
 15. Describe the major differences between the male and female skeleton, use the pelvis as a major point of comparison.
 16. Describe how the skeleton and its proportions change from infancy to childhood to adolescence to adulthood to senescence.
 17. Differentiate, on the basis of movement, among synarthroses, amphiarthroses and diarthroses.
 18. Describe fibrous, cartilaginous and synovial joints, Give specific examples of each.
 19. Identify and describe the structures and tissues associated with a typical synovial joint.
 20. Define, describe and demonstrate the following movements: FLEXION – EXTENSION, ABDUCTION-ADDUCTION, ROTATION. Describe how those movements can combine and modify into all the body's movements.
 21. Describe and give examples of the following types of diarthroses: GLIDING, HINGE, PIVOT, BALL-&-SOCKET, SADDLE, CONDYLOID.
 22. Describe the steps involved in repair of a fractured bone.

UNIT 9 – Muscular System

1. List the functions of the body's muscles and describe the characteristics of muscle cells and tissue.
2. Describe the three types of muscle tissue. Distinguish among them on the basis of histology, neural control, locations in the body and general functions.
3. Describe the connective tissues associated with skeletal muscles.
4. Using the SLIDING FILAMENT MECHANISM as a model, describe the roles of the following in muscle contraction: somatic motor neuron, acetylcholine, neuromuscular junction, acetylcholinesterase, muscle fiber, myofibrils, sarcomeres, actin, myosin, Ca⁺⁺.
5. Define the MOTOR UNIT. Relate the number of motor units recruited to the strength of muscle contraction and the precision of muscle control.
6. Describe the role played by each of the following in meeting the energy needs of muscle contraction: ATP, creatine phosphate, myoglobin, glycogen.
7. Distinguish between aerobic and anaerobic reactions. Identify the reactants and products of aerobic and anaerobic reactions as far as muscle contraction is concerned.
8. Describe the concept of OXYGEN DEBT. Describe how it forms and how the cardiovascular & respiratory systems respond to muscle activity.
9. Distinguish among Slow Oxidative, Fast Oxidative-Glycolytic and Fast Glycolytic muscle fibers.

10. Distinguish between ISOMETRIC and ISOTONIC contractions.
11. Describe the events of a myographic recording of a TWITCH contraction.
12. Define: TETANIC CONTRACTIONS (fused and unfused), WAVE SUMMATION and MUSCLE TONE.
13. Define a muscle's ORIGIN and INSERTION.
14. Describe how muscles, bones and joints form the LEVER SYSTEMS that enable movement to occur.
15. Describe and give examples of SYNERGISTIC and ANTAGONISTIC muscle groups. Define what an AGONIST (prime mover) is.
16. Describe and give examples of the various criteria used in naming muscles, e.g. size, location, shape, origin-insertion, action, direction of fibers, number of origins, etc.
17. Be able to locate, describe the actions and give the origins and insertions of the following muscles: Pectoralis major, Serratus anterior, Trapezius, Deltoid, Teres major, Latissimus dorsi, Sternocleidomastoid, Biceps brachii, Triceps brachii, Brachialis, Brachioradialis, External oblique, Internal oblique, Rectus abdominis, Gluteus maximus, Gluteus medius, Gluteus minimus, Adductor longus, Gracilis, Rectus femoris, Vastus lateralis, Vastus medialis, Sartorius, Biceps femoris, Semitendinosus, Semimembranosus, Gastrocnemius, Soleus, Tibialis anterior.

UNIT 10 – Nervous System

1. Describe the functions of the nervous system.
2. Describe the structural and functional organization of the nervous system.
3. Identify the structures and components of a typical neuron. Describe their general functions.
4. Describe the criteria used in classifying neurons.
5. Describe different types of neuroglia and give their locations and functions.
6. Describe the structure and functions of the myelin sheath.
7. Describe the mechanisms and limitations of nerve fiber regeneration.
8. Distinguish between Gray and White Matter.
9. Describe the characteristics of the following as they relate to neuron function: Resting Membrane Potential, Action Potential, depolarization, repolarization. Describe the roles played by gated ion channels, Na⁺ and K⁺.
10. Describe how the action potential propagates along nerve fibers. Define Saltatory Conduction.
11. Describe the Refractory Period. Differentiate between Relative and Absolute phases.
12. Describe the structures and events that are associated with the chemical synapse. Describe the roles of Neurotransmitters and Neurotransmitter Receptors. Describe what happens to Neurotransmitter molecules.
13. Distinguish between Excitatory and Inhibitory Postsynaptic Potentials
14. Give examples of different types and categories of Neurotransmitters.
15. Define Summation as it relates to events at the synapses. Distinguish between Temporal and Spatial Summation.

16. Define the concept of Neural Circuits. Describe examples of Simple Series, Diverging, Converging, Parallel and Reverberating Circuits.