Chapter 1. INTRODUCTION TO ANATOMY AND PHYSIOLOGY

1. Distinguish between anatomy and physiology. Explain the relationship between the form (structure) and function (physiology) of human body parts.

2. Explain what is meant by the term homeostasis. Describe several homeostatic regulatory mechanisms in the human body. What is the internal environment? Use maintenance of body temperature as one example of a homeostatic mechanism and be able to explain the process in detail.

3. List and describe the levels of complexity within the human body from the atomic through the organ-system level. What is the lowest level that possesses the characteristics of life?

Chapter 2. THE CHEMICAL BASIS OF LIFE

1. List the four most abundant elements in the human body. What is a trace element? Explain the relationship between elements and atoms.

2. Describe the major parts of an atom. How are electrons, protons, and neutrons positioned in an atom? Explain why a complete atom is electrically neutral.

3. What is bonding? How do covalent and ionic bonds differ? What is a molecule? What is an ion? Define a positive ion and a negative ion. List several examples of ions.

4. Distinguish between a molecular (chemical) formula and a structural formula.

5. Describe a chemical reaction (Rx). Compare a synthesis reaction to a decomposition reaction. What is a catalyst?

6. Define an acid. Explain what is meant by pH, and describe the pH scale. What are the approximate pH values of the following common substances: gastric juice, milk of magnesia, freshly distilled water, lemon, sodium bicarbonate, and human blood? How is the hydrogen ion concentration related to the pH scale? What is a buffer?

7. Distinguish between organic and inorganic molecules. What is the difference between an electrolyte and a nonelectrolyte?

8. Describe the general characteristics of carbohydrates. Write the molecular formula of a common carbohydrate (e.g., glucose) to indicate the atoms and their proportions to one another.

9. Based on structure and function, distinguish between monosaccharides, disaccharides, and polysaccharides. List examples of each.

10. List several types of lipids. What are some of the functions of lipids in the human organism? Name the major building blocks of a fat molecule (triglyceride). How do saturated and unsaturated fats differ?

11. Describe the general characteristics of proteins. What are the basic building blocks of proteins? Define enzyme. Explain how protein molecules may become denatured. What element is found in proteins but is not found in carbohydrates and fats?
12. Describe the general characteristics and functions of nucleic acids. Name the three basic components of a nucleotide. Name the two major types of nucleic acids and give their abbreviations and general functions.

13. Using specific examples describe how the structure of a molecule is related to its function.

**Chapter 3. CELLS**

1. Using specific examples, describe how the structure of a cell is related to its functions.

2. Describe the chemical structure of the cell (cytoplasmic) membrane. Discuss the functions of the cell membrane. Define selectively permeable. What molecules in the cell membrane may act as passageways or "pores"? What is a major importance of phospholipid in the membrane?

3. What are organelles? Describe the structure and functions of each of the following organelles:
   - endoplasmic reticulum (smooth, rough)
   - centrosome (centrioles)
   - cilia
   - ribosome
   - vacuoles (vesicles)
   - flagelum
   - Golgi apparatus
   - mitochondria
   - lysosomes
   - cytoskeleton
   - microtubules & microfilaments

4. Describe the structure of the nucleus and the functions of its parts, e.g., nuclear membrane, nucleolus. What is the chemical composition of chromatin and indicate what it develops into during cell reproduction (mitosis). For a review -- Label figures and complete pg 1 of the report form in Laboratory Exercise 4.

5. Explain the difference between diffusion and osmosis. Discuss how diffusion aids in the exchange of gases in the lungs. What kinds of substances move most readily through a cell membrane by diffusion? Give some important examples.

6. Discuss the process of dialysis. What type of transport process is being used? How is this principle used to help regulate the composition of substances in the blood (e.g., urea, glucose, and electrolytes) in a patient using the artificial kidney (hemodialysis)?

7. Distinguish between solutions that are hypertonic, hypotonic, and isotonic, and describe what effect each has on cells and why. What is hemolysis and what type of solution causes it? Distinguish between high and low osmolarity. What is crenation?

8. Define filtration and explain how it is associated with the movement of substances through capillary walls. What kinds of substances will filter out of the capillary and become interstitial (tissue) fluid? What substances will tend not to leave the blood within the capillaries? What is hydrostatic pressure? How does it differ from osmotic pressure?

9. Describe the process of active transport and give an example of it in the body. Compare active transport to diffusion -- what are some basic differences?

10. Distinguish between pinocytosis and phagocytosis.
11. Review all processes by which molecules move. How do they differ from each other? Which ones share common features? What is the source of energy in each?

12. Explain the cell cycle. Describe the cellular appearance and events that occur in each phase of mitosis. Why is it important that the division of nuclear materials during mitosis be so precise? When are DNA molecules duplicated during the life cycle of a cell? Describe interphase.

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13. Define differentiation. Indicate one possible hypothesis to explain how differentiation occurs.

14. What is a stem cell? Where are they found in the body? Distinguish between hyperplasia, anaplasia, and metastasis.

Chapter 4. CELLULAR METABOLISM

1. What is metabolism? Distinguish between anabolic and catabolic metabolism. Give examples of anabolic and catabolic metabolism. Hydrolysis (or digestion) is responsible for the breakdown of large carbohydrates into _____, fats into ______ and _______, and proteins into ______. Describe dehydration synthesis and know it is responsible for protein, carbohydrate, and lipid formation. Be able to recognize examples of hydrolysis or dehydration from chemical reactions.

2. Describe an enzyme. List 5 characteristics of enzymes. What is a substrate? Describe how an enzyme is thought to interact with its substrate when it catalyzes a chemical reaction. Define a catalyst. What factors are likely to denature enzymes? What is a coenzyme? A cofactor?

3. Define energy. How does the breakdown (oxidation) of glucose inside cells differ from the breakdown (burning) of glucose outside of the body?

4. Explain the importance of ATP to cellular processes. Describe the relationship between ATP and ADP within the cell (the ATP cycle). NOTE: A study of cellular respiration will be presented in Biol 106.

5. Distinguish between anaerobic (lactic acid fermentation) and aerobic (cellular) respiration in regard to: where in the cell the process occurs; the final products of glucose catabolism; the amount of ATP produced per glucose.

6. What is the function of DNA? Describe the relationship between a DNA molecule, a gene, a chromosome, an amino acid, and a protein.

7. Describe the structure of the DNA molecule. Specifically, what bases pair with one another in a DNA molecule? If the sequence of bases in one strand of a DNA molecule is C-G-C-A-T-T, what is the base sequence in the complementary second strand? What is the base sequence for mRNA? What amino acids are specified?

8. Explain how genetic information is stored in a DNA molecule. How is information carried from the nucleus to the cytoplasm? What is a codon? What is the function of transfer RNA? What is an anticodon?

9. Define mutation and explain how mutations may originate. Why is a mutation in a cell of an embryo likely to be more significant than one in a cell of an adult? What is worse, a mutation which results in the death of a cell or a mutation which alters cell activity but doesn't destroy the cell? Explain.
Chapter 5. **TISSUES**

1. Define a tissue. List the four major classifications for tissues found in the human body.

2. Describe the general characteristics of epithelial tissue. Be able to distinguish between simple squamous, simple cuboidal, simple columnar, pseudo-stratified ciliated columnar, stratified squamous epithelium, and transitional epithelium. Indicate areas or organs of the body that are composed of these tissues. Describe the special functions of each type of epithelium.

3. Describe the structure and function of a goblet cell, mucus, microvillus, basement membrane, and keratin.

4. Describe the general characteristics of connective tissue. How does connective tissue differ from epithelial tissue? Describe the following: matrix, fibroblasts, macrophages, collagen, elastin, and edema.

5. Describe the structure, function(s), and location(s) of loose (areolar) connective tissue, adipose tissue, and dense (fibrous) connective tissue. Distinguish between a tendon and a ligament.

6. How does bone differ from cartilage? Name three (3) types of cartilage and indicate some areas in the body where each type would be found.

7. Describe each of the following: Haversian system (osteon), Haversian canal (osteonic canal), osteoblast, osteoclast, lacuna (e), lamella (e), canaliculus (i), and chondrocyte.

8. Compare the three- (3) types of muscle tissues in appearance and means of control.

9. What are the two major groups of cells in nerve tissue? How do they differ?

10. Using specific examples describe how the structure of a tissue relates to its function.

Chapter 6. **THE SKIN AND THE INTEGUMENTARY SYSTEM**

1. Name the four types of membranes and explain how they are similar and how they differ. List locations of these different membranes. What special secretion(s) is (are) related to each of these membranes? Why is a membrane considered an organ?

2. What is the integumentary system? Describe the general functions of the skin (cutaneous membrane). Describe the superficial and deep (inner) layers of the skin. Describe the subcutaneous (hypodermal) layer and its functions. Distinguish between subcutaneous and intradermal injections.

3. Explain how the epidermis is formed. Distinguish between the stratum germinativum and stratum corneum. What is keratinization? List the functions of the epidermis. What is the function of melanocytes and melanin?

4. What kinds of tissues make up the dermis? What are the functions of dermal blood vessels? Describe a decubitus ulcer. Where are sensory nerve cell receptors located?

5. Describe the structure, function, and location of the following: hair follicle, arrector pili muscles, sebaceous glands, sebum, apocrine glands, and eccrine glands. What excretory (waste) products are secreted to a limited degree in sweat? Compare and contrast the two types of sweat glands.

6. Explain how body heat is produced. Describe the mechanisms whereby the body loses heat. Describe the body's responses to decreasing body temperature. How does high humidity interfere with body temperature regulation?
7. Explain how skin cancer develops. Compare and contrast cutaneous carcinomas (basal cell carcinoma and squamous cell carcinoma) from cutaneous melanomas or malignant melanoma.

8. Describe the events that are a part of wound healing.

9. Describe each of the following terms associated with the integumentary system (Use text and dictionary).
   - alopecia
   - callus
   - carcinoma
   - cyst
   - ulcer
   - erythema
   - malignant
   - neoplasm
   - dermatitis
   - tumor (oma)
   - sebum
   - oncology
   - sarcoma
   - mole (nevus)
   - melanoma

Chapter 1: Return and complete objectives 4-16 for this section.

4. Distinguish between the axial and appendicular portions of the body.

5. Distinguish between the dorsal and ventral body cavities and name the smaller subdivisions that occur within each. What separates thoracic and abdominal cavities? Describe a visceral organ. Give an example of a non-visceral organ.

6. Describe the mediastinum. What structures are located in the mediastinum? List at least 5 structures.

7. Describe the following serous membranes and "spaces": parietal pleura, visceral pleura, parietal peritoneum, visceral peritoneum, peritoneal cavity, visceral pericardium, and parietal pericardium.

8. Indicate where each of the following organs is found (pleural cavity, abdominal cavity, pelvic cavity, or mediastinum).
   - gall bladder
   - uterus
   - urinary bladder
   - liver
   - lung
   - trachea
   - esophagus
   - pancreas
   - spleen
   - thymus gland
   - heart
   - stomach
   - rectum
   - kidneys
   - small intestine
   - prostate gland

9. Classify each of the above organs into a system.

10. Describe the anatomical position. Define the following terms and be able to use them to describe the relative location of various parts of the body: superior, inferior, anterior (or ventral), posterior (or dorsal), medial, lateral, proximal, distal, superficial, deep.

11. The urinary bladder is _____ to the diaphragm (supply the correct directional term). The eyes are to the nose. The sternum (breastbone) is _____ to the mammary glands. The shoulder is located at the (proximal or distal) end of the arm. Which joint (hip or knee) lies at the distal end of the thigh?

12. Distinguish between sagittal, mid-sagittal, frontal (or coronal), and transverse planes. Try to visualize what the above sections would "look like" in different areas of the body (use torso diagrams to help). Practice these with a pencil, a broom, and a tie shoe as specimens. Be able to diagram an elongated organ in cross section (c.s.), longitudinal section (l.s.), or oblique section (o.s.).

13. Be able to identify the nine abdominal regions on a diagram or via description.

14. Be able to identify the following body regions: abdominal, acromial, antebrachium, antecubital, axillary, brachial, buccal, carpal, cephalic, cervical, costal, coxal, cubital, cutaneous, digital, dorsum, frontal, genital, glutal, groin, inguinal, loin, lumbar, mammary, mental, nasal, occipital, ophthalmic, oral, orbital, otic, palmar, patellar, pectoral, pedal, pelvic, perineal, plantar, popliteal, sacral, sternal, tarsal, umbilical, vertebral.

15. Be able to distinguish the following medical and applied sciences: cardiology, cytology, dermatology, endocrinology, epidemiology, gastroenterology, geriatrics, gerontology, gross anatomy, gynecology.
hematology, histology, immunology, neurology, obstetrics, oncology, ophthalmology, orthopedics, otolaryngology, pathology, pediatrics, pharmacology, psychiatry, radiology, toxicology, and urology.

- For a good review -- label the figures and complete the report in your Laboratory Manual for Exercise 2 (Hole's 8th Edition). Note: some terms in the Exercise will not be in your text - omit these.

Chapter 7 THE SKELETAL SYSTEM

1. Sketch a long bone such as the femur or humerus, and label the following: epiphyses (proximal and distal), diaphysis, medullary (marrow) cavity, periosteum, articular cartilage, yellow marrow, endosteum, compact bone, and spongy bone (contains red marrow). Be able to describe the structure and the functions of the above named structures. Distinguish between red and yellow bone marrow.

2. Be able to describe and diagram the microscopic structure (histology) of compact bone. Review the following structures: Haversian (osteonic) canal, osteocytes, lacunae, canaliculi, matrix, Volkmann's (communicating) canals, and Haversian system (osteon). (Review the chapter on histology.)

3. Distinguish between osteocytes, osteoblasts and osteoclasts. Explain the significance and function of the epiphyseal disk (also called the epiphyseal plate or growth plate).

4. Distinguish between traumatic and spontaneous fractures and between simple (closed) and compound (open) fractures. What is a callus in bone tissue? Explain fracture repair.

5. Describe the major functions of the skeletal system. Define hematopoiesis. What types of blood cells does the red marrow produce? Indicate specific bones in the adult that contain red marrow.

6. Distinguish between the axial and appendicular skeleton. Know which bones belong to each.

7. Define and provide examples of the terms used to describe skeletal structures, e.g., condyle, crest, facet, fontanel, foramen (foramina), fossa, head, meatus, process, sinus, suture, trochanter, and tuberosity.

8. Be able to identify via diagram, description, or skeleton, the following bones and markings associated with the skull: (Note: A marking is a distinctive structural feature or landmark associated with a bone.)

   frontal
   frontal sinus
   lacrimal
   nasal
   parietal
   maxillary
   maxillary sinus
   temporal
   external auditory meatus
   mastoid process and sinus
   mandible
   palatine
   occipital
   occipital condyles
   inferior nasal conchae (turbinates)
   zygomatic
   sphenoid
   foramen magnum
   malleus
   nasals
   sphenoidal sinus
   incus
   stapes
   ethmoid
   ethmoidal sinuses
   anterior fontanel
   conchae (superior & middle)
   nasal septum
   hard palate

9. Locate and name each of the bones of the cranium. How many bones comprise the cranium? What are fontanelles? Give two reasons why they are important.

10. Locate and name each of the bones of the face.
11. Name and locate the five regions of the vertebral column (spine) and state the number of vertebrae found in each in an adult. Describe the functions of the inter-vertebral disks. Describe and identify the following structures that are associated with vertebrae: body, vertebral foramen, spinous process, transverse process, transverse foramina, superior articulating processes, inferior articulating processes. Distinguish cervical, thoracic, and lumbar vertebrae from each other. Describe the position of a vertebra in the body - what part is anterior? Posterior? Lateral? How many vertebrae do you have (total number)?

12. What is the importance of the intervertebral foramina? Name the first cervical vertebra. Name the second cervical vertebrae? What is the function of the foramina in the sacrum? What vertebrae have rib facets?

13. How do the curvatures in the vertebral column of an adult differ from those of a neonate (newborn). What changes in the vertebral column take place during the first year or two of life? What are the advantages associated with normal spinal curvatures?

14. Distinguish between kyphosis, lordosis, and scoliosis. What is a ruptured or herniated disc?

15. Describe the structure and function of the thoracic cage. Distinguish between true ribs, false ribs, and floating ribs, and indicate numbers. What is costal cartilage? Name the piece of cartilage (or bone) attached to the lower end of the sternum. What is a sternal puncture? What is the manubrium?

16. What bones form the pectoral girdle? …the bones that form the upper limb? Be able to identify via diagram, description or skeleton, the following bones and markings associated with the pectoral girdle and upper limb:  
   **Clavicle**  
   **Ulna**  
   Olecranon process  
   **Radius**  
   **Scapula**  
   Spine (of the scapula)  
   Coracoid process  
   Acromion process  
   Glenoid cavity  
   **Carpals**  
   **Metacarpals (1-5)**  
   **Humerus**  
   Head of humerus  
   **Phalanges:**  
   Proximal, middle, distal phalanx

17. Be able to identify via diagram, description or skeleton, the following bones and markings associated with the pelvic girdle and lower limb:  
   **Os coxa** (or innominate)  
   Acetabulum  
   Ilium  
   Iliac crest  
   Sacroiliac joint  
   Anterior superior iliac spine  
   Ischium  
   Ischial tuberosity  
   Pubis or pubic bone  
   Symphysis pubis  
   **Femur**  
   Head and neck (of the femur)  
   Greater and lesser trochanter  
   Lateral and medial condyles (of the femur)  
   **Patella**  
   **Tibia**  
   Tibial tuberosity  
   **Fibula**  
   **Tarsals** (Calcaneus and Talus)  
   **Metatarsals (1-5)**  
   **Phalanges** (proximal, middle, and distal phalanx)

18. Distinguish between immovable joints (synarthroses), slightly moveable joints (amphiarthroses), and freely movable joints (diarthroses) in terms of their structure, and give examples of each.

19. Be able to define and give examples of the following types of body movements caused by skeletal muscle contractions: flexion, extension, hyperextension, abduction, adduction, rotation (medial and lateral),
circumduction, pronation, supination, inversion, eversion, protraction, retraction, elevation, depression, plantar flexion, dorsiflexion.

20. List six types of synovial (freely movable) joints. Indicate where they are found in the skeleton and describe movements of each.

21. Know the following clinical terms related to the skeletal system. If you learn the derivation of each section future terms will be easier to learn.

| A/chondro/plasia | Crani/otomy | Oste/itis |
| Acro/megalgy     | Gout (gouty arthr/itis) | Oste/oma |
| Ankyl/osis       | Hem/arthritis | Osteo/malacia |
| Arthr/algia      | Laminectomy | Osteo/myel/itis |
| Arthr/itis       | Ortho/ped/ics | Osteo/necr/osis |
| Articulation     | Oste/agglia  | Osteo/por/osis |
| Arthro/centesis  | Ost/ectomy   | Pro/thesis |

22. Distinguish between rheumatoid arthritis (RA) and osteoarthritis (OA) using the following: etiologic factor(s); age of onset; risk factors; pathogenesis; and general treatment.

Chapter 8 THE MUSCULAR SYSTEM

1. List the general functions of muscle tissue. Compare and contrast the location, functions, histological appearance, mode of control (voluntary or involuntary), and contraction characteristics of skeletal, smooth, and cardiac muscle. (Review the section on muscles in the histology chapter.)

2. Compare and contrast fascia (superficial and deep), tendons, ligaments and aponeuroses.

3. Describe the following structures: sarcolemma, sarcoplasm, sarcomere, myofibril, and filaments.

4. Describe a neuromuscular junction. Include motor neuron, axonal (synaptic) knob, mitochondria, synaptic vesicles, synaptic cleft, neurotransmitter substance (acetylcholine), cholinesterase, motor end plate, and neurotransmitter receptors.

5. Define a motor unit and all-or-none response.

6. Explain muscle tone (tonus). How is muscle tone related to posture?

7. Distinguish between muscular hypertrophy and atrophy. Explain how each may be caused.

**NOTE:** The more detailed structure (ultrastructure) of the muscle fiber, the sliding filament theory, and the physiology of muscle tissue will be presented in Biology 106.

8. Distinguish between a muscle's origin and its insertion. Define prime mover, synergist, and antagonist. List an example of a prime mover, a synergist to the prime mover, and an antagonist to the prime mover in the body.

9. Be able to describe the location, attachment (origin(s) and insertion(s)), and action(s) of the following muscles. **NOTE:** If you think about the reason for the name of each, you may remember them easier!

| Orbicularis oculi | Gluteus maximus | External oblique |
| Orbicularis oris | Gluteus medius | Deltoid |
| Masseter         | Adductor longus | Linea alba |
| Sternocleidomastoid | Hamstring group (Biceps femoris, | |
| Trapezius        | Semitendinosus, Semimembranosus | |

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10. What is myasthenia gravis?

Chapter 9 THE NERVOUS SYSTEM

1. Discuss the general functions of the nervous system. What other system has similar functions?

2. Describe the central nervous system (CNS) and peripheral nervous system (PNS). List the component parts of the CNS and the PNS along with their functions.

3. Define a neuron. Describe the structure and function of each major neuronal structure: cell body (Soma), dendrite, nucleus, nucleolus, neurofibrils, Nissl bodies (chromatophilic substance), axonal hillock, axon, and the synaptic knob. Do all neurons have Nodes of Ranvier? Why or why not? What are the 2 types of nerve fibers extending from the cell body of a neuron called?

4. How does a neuron differ from a nerve? Describe the 3 structural types of neurons. Distinguish between sensory (afferent) neurons, motor (efferent) neurons, and interneurons (association neurons) in regard to structure, function, and location. Be able to define terms such as: receptor, afferent, efferent, effector, multipolar, bipolar, unipolar.

5. Distinguish between neurons and neuroglial cells. What are some of the types and functions of neuroglial cells.

NOTE: Nerve membrane potentials, the development and transmission of an action potential (nerve impulse), and more detailed physiology of the nervous system will be studied in Biology 106.

6. Define a synapse. Describe the microscopic anatomy of a synapse. Make a diagram showing a synaptic (axonal) knob, synaptic vesicles, synaptic cleft, and neurotransmitters. Briefly describe what happens in a synapse when a nerve impulse is transmitted from one neuron to another. Name five neurotransmitters found in the nervous system. How does a synapse differ from a neuromuscular junction?

7. How is a neuron related to a nerve? Distinguish between myelinated and unmyelinated nerve fibers. What cells form myelin in the CNS? In the PNS? Compare and contrast white matter and gray matter. Distinguish between sensory, motor, and mixed nerves.

8. Explain what is meant by a nerve pathway. What is a reflex arc? Diagram and describe the major components of a three-neuron reflex arc (withdrawal reflex). Include the three neurons involved, receptor, effector, synapses, dorsal root ganglion, dorsal (posterior) root, ventral (anterior) root, spinal nerve, and gray and white matter of the spinal cord. What is a reflex? How does a person become aware of a reflex and the associated feeling?

9. Name the three layers of the meninges (from superficial to deep). Explain how the acronym DASP might be used to explain the relationship of the meninges to each other. What are the general functions of the meninges? Where is cerebrospinal fluid found (in reference to the meninges)? How does the dura mater differ in areas of the brain from the dura of the spinal cord?

10. Where does the spinal cord begin? End? What is the cervical enlargement? Lumbar enlargement? Diagram and label a cross section of the spinal cord. Include the following structures: anterior median fissure, posterior median sulcus, gray matter, white matter (anterior funiculus, lateral funiculus, and the
posterior funiculus), central canal, gray commissure, horns (anterior, posterior, and lateral horns). What structures are found in each? Also identify the anterior root, posterior root, and the spinal nerve.

11. What general functions are performed by the spinal cord? Distinguish between the function of an ascending and a descending tract.

12. Name the three major portions of the brain and describe the general functions of each.

13. Be able to identify (via diagram, model, or description) the following structures or areas associated with the cerebrum: cerebral hemispheres, corpus callosum, convolution (gyrus), groove (sulcus), longitudinal fissure, frontal lobe, central sulcus, lateral sulcus (or fissure), parietal lobe, temporal lobe, occipital lobe, cerebral cortex, precentral gyrus, primary motor area, postcentral gyrus, general sensory area, visual area, and auditory area, association areas.

14. Name and describe the location of the four ventricles of the brain. What are the functions of cerebrospinal fluid (CSF)? What are choroid plexuses and where are they located?

15. Describe the location of the diencephalon. What three structures make up the diencephalon? What are nuclei?

16. Describe the functions of the thalamus. Describe the functions of the hypothalamus.

17. List the structures that make up the brain stem. List the general functions of each area. Describe the functions of the vital reflex centers in the medulla oblongata.

18. Where is the cerebellum located? Describe the functions of the cerebellum? What are proprioceptors and where are they located?

19. What comprises the peripheral nervous system? Distinguish between the somatic and autonomic nervous systems. What type of muscle is controlled by each?

20. Know the name, number, type (sensory, motor, or mixed), and functions of the following cranial nerves: I Olfactory, II Optic, III Oculomotor, V Trigeminal, VII Facial, VIII Vestibulocochlear, X Vagus. Know which cranial nerves carry autonomic fibers and what those fibers do. What is Bell's Palsy? What cranial nerve pair is affected?

21. What is the total number of cranial nerves? How many pairs of spinal nerves originate from the spinal cord. Explain how the spinal nerves are grouped and numbered. Define a spinal nerve plexus.

22. List the types of tissues that are innervated by the autonomic nervous system. What types of body functions are regulated by the autonomic nervous system (ANS)?

23. Discuss the general functional differences between the sympathetic and para-sympathetic subdivisions of the autonomic nervous system.

24. How do autonomic and somatic motor pathways differ? Distinguish between a preganglionic, (presynaptic) and postganglionic (postsynaptic) nerve fiber.

25. Anatomically, distinguish between the sympathetic and parasympathetic divisions of the autonomic nervous system. Describe a sympathetic nerve pathway. Describe a parasympathetic nerve pathway.

26. Describe the neurotransmitters that are secreted by pre and post ganglionic fibers of the sympathetic and parasympathetic divisions of the ANS. Explain why the effects of the sympathetic and parasympathetic divisions differ.
27. Compare and contrast sympathetic and parasympathetic effects on visceral structures. Such as: pupil of the eye, heart, bronchioles, muscles of the intestinal wall, digestive glands, blood distribution, blood glucose concentration, salivary glands, muscles of the urinary bladder. What division prepares the body for "fight or flight"? What division is responsible for "internal housekeeping"?

Chapter 10  **SOMATIC AND SPECIAL SENSES**

1. Distinguish between general somatic, visceral somatic, and special senses.

2. Distinguish among chemoreceptors, pain receptors (nociceptors), thermo-receptors, mechanoreceptors, and photoreceptors based on stimulus. What is a sensation? Explain what must take place for a sensation to occur (Covered in lecture).

3. What is referred pain? What is phantom pain? Provide an example of each phenomenon.

4. What is sensory adaptation? Is it slow or rapid in: olfactory receptors, taste receptors, pain receptors? Where are olfactory receptors located? What is anosmia?

5. Why is saliva necessary for a sense of taste? Name the four primary taste sensations. Where are taste buds located? Where are taste receptors located? Know that taste and smell are synergistic senses.

6. Distinguish between the external, middle, and inner ear. Identify from a drawing, model, or via description, the following parts of the ear: external ear, middle ear, inner ear, pinna (auricle), external auditory meatus (ear canal), tympanic membrane (ear drum), eustachian (auditory) tube, malleus, incus, stapes, oval window, round window, semicircular canals, cochlea, vestibulocochlear (auditory) nerve, and tympanic cavity. Explain the function(s) of each of the above named structures.

7. Trace the path of sound waves through the structures of the ear until they are finally converted into nerve impulses by the hearing sense organ (organ of Corti).

8. Describe the organ of Corti in terms of its general structure and function. Trace a nerve impulse from the organ of Corti to the interpreting centers of the cerebrum.

9. Distinguish between conductive and sensorineural (sensory) deafness. List possible causes of each.

10. Define the vestibule. What two structures are found within the vestibule associated with the sense of static equilibrium?

11. Distinguish dynamic equilibrium from static equilibrium. What structures in the inner ear are associated with dynamic equilibrium? What part of the brain is particularly important in interpreting impulses from the semicircular canals? How does sensory information from other receptors help maintain equilibrium?

12. List the visual accessory organs and describe the functions of each. What function does lysozyme have in tears?

13. What causes diplopia?

14. Describe the three basic layers or coats that form the wall of the eyeball. Be able to diagram and/or identify from a drawing, model, or description, the following parts of the eye: cornea, sclera, extrinsic muscles, anterior chamber, posterior chamber, aqueous humor, iris, lens, pupil, suspensory ligaments, ciliary body (contains ciliary muscle), vitreous humor, retina, fovea centralis, choroid coat, optic nerve, optic disc. You should be prepared to explain the function(s) of each of the above named structures.
15. What is accommodation? How is it accomplished? (Be specific - include lens, ciliary body muscles, suspensory ligaments, parasympathetic and sympathetic divisions of the ANS).

16. Trace the path of light rays (mentioning transparent structures that they pass through) passing into the eye and finally forming an image on the retina.

17. What is the source of aqueous humor? What is its destination? Describe glaucoma.

18. What is meant by the term refraction? What parts of the eye provide refracting surfaces? How are light waves affected by a convex lens? By a concave lens? What is presbyopia? Identify its cause. What is a cataract and how can it be treated? What is glaucoma?

19. Distinguish between the functions of the rods and cones. What is visual acuity? Explain why cone vision is generally more acute than rod vision. Where are the cones most heavily concentrated? Why is the optic disc called the blind spot?

20. Describe the function of rhodopsin. What can cause night blindness (nyctalopia)?

21. Explain how nerve impulses from the retina in the right eye reach the visual cortex (occipital lobe) in both the left and right cerebral hemispheres. What is the optic chiasma? How does visual information carried in an optic nerve differ from that in an optic tract?

22. Know the following terms pertaining to the ear or eye: astigmatism, emmetropia, hyperopia, iritis, keratitis, myopia, otitis media, and presbyopia.

**Chapter 15  THE DIGESTIVE SYSTEM**

1. Describe the general functions of the digestive system.

2. List and describe the location of each of the major organs of the alimentary canal. How does it differ from the gastrointestinal tract? List and describe the location of each of the accessory organs of the digestive system.

3. Know the location and function(s) and be able to identify (on a diagram, model, or via written description) the following structures of the digestive system:
   - mouth, tongue, papillae, palate (hard & soft), uvula
   - teeth
   - salivary glands (parotid, submandibular, sublingual)
   - tonsils (lingual, palatine, pharyngeal or adenoids)
   - pharynx (nasal-, oral-, laryngeal-)
   - esophagus
   - cardiac sphincter
   - stomach (gastric pits, chief cells, parietal cells)
   - pyloric sphincter
   - small intestine (duodenum, jejunum, ileum)
   - liver
   - gall bladder
   - cystic duct, right and left hepatic ducts, common bile duct, common hepatic duct
   - pancreas, pancreatic duct
   - ileocecal valve (sphincter)
   - large intestine (cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum, anal canal, and the appendix)

4. Describe peristalsis.
5. Compare primary (deciduous) teeth and secondary (permanent) teeth. What are the four basic types of permanent teeth? From the standpoint of digestion, what is the most important function of mastication?

6. List and describe the location of the major salivary glands. What is the function of saliva? Indicate the enzyme secreted by the salivary glands and state its function—what food does it act upon and what is the resulting product? Where else is this enzyme produced?

7. Describe the composition of gastric juice. What is the most important digestive action of gastric juice? Distinguish between chief and parietal cells. Discuss the function of the pyloric sphincter. What is chyme? What is intrinsic factor? What is a peptic ulcer?

8. How do the following hormones influence the digestive system: gastrin, secretin, and cholecystokinin.

9. Why is the pancreas considered a dual gland? Distinguish between exocrine and endocrine gland. List the enzymes found in pancreatic juice. What are the functions of these enzymes? Describe the function of the sodium bicarbonate that is secreted by the pancreas.

10. List some of the major functions of the liver. What is the function of the hepatic-portal vein? Why is this important? Name and identify the various ducts that connect the liver, gall bladder, and pancreas with the small intestine.

11. Describe the origin and composition of bile. What is the function of the gall bladder. What type of food has the greatest effect on the gall bladder causing ejection of bile into the duodenum? Explain how bile salts aid the process of fat digestion. What is emulsification?

12. List and describe the three different regions of the small intestine. What is the function of the mesentery and where is it located? Describe the structure and functions of the intestinal villi. What are the functions of the following intestinal enzymes: peptidases, sucrase, maltase, lactase. What substances result from the digestion of carbohydrate? Protein? Fat? Which of these molecules are absorbed by the small intestine capillaries? By small intestine lacteals?

13. Be able to state the substrate(s) and product(s) for each of the following enzymes as well as the organ(s) in which it (the enzyme) is produced:

- salivary amylase
- pepsin
- maltase
- nuclease
- peptidase (intestine)
- sucrase
- lactase
- pancreatic lipase
- pancreatic amylase
- trypsin

14. List and describe the location of the parts of the large intestine. How does the length and diameter of the large intestine compare with the small intestine? What activities occur in each?

15. Describe each of the two sphincter muscles of the anus in terms of the type of muscle each is made of and the type of control (voluntary or involuntary) each is under.
1. List the major functions of blood. What are the major components of blood?

2. Describe a red blood cell, also called an erythrocyte (structure, origin, and function). Distinguish between oxyhemoglobin and deoxyhemoglobin. What is the average life expectancy of a red blood cell (rbc)? Give an example of a normal red blood cell count for a male? For a female? Mature circulating rbc’s do not undergo mitosis. Why?

3. Define hematocrit and explain how it is determined. Where are red blood cells produced? What hormone is involved and what organ releases it? What stimulates RBC productions?

4. What is anemia? Compare the causes of hemorrhagic, aplastic, and hemolytic anemia.

5. What is a normal white blood cell count? Distinguish between leukocytosis and leukopenia. Name the five different types of leukocytes. Describe the functions of neutrophils, monocytes, and lymphocytes. Define diapedesis.

6. What is a differential white blood cell count? Know a normal blood percentage for each type of leukocyte. Explain the significance of white blood cell counts as aids to diagnosing diseases. NOTE: In lab you will be required to distinguish a neutrophil and a lymphocyte.

7. Describe a blood platelet and explain its functions. What is a normal blood platelet count?

8. List some of the functions of plasma. List three types of plasma proteins and state the functions of each. How does albumin help to maintain a water balance between the blood and the tissues? What is the origin of these plasma proteins?

9. Briefly describe the events which occur during an inflammation.

10. List two nonprotein nitrogenous substances in plasma that are products of protein and nucleic acid catabolism. Name several important plasma electrolytes. What gases occur in plasma?

11. What is meant by hemostasis? Describe two hemostatic events that can occur before blood coagulates. Describe the basic events that occur during blood coagulation. In your discussion show the interrelationships between fibrinogen, fibrin, thrombin, prothrombin, calcium ions and prothrombin activator. Where are fibrinogen and prothrombin made?

12. Discuss the importance of vitamin K in blood coagulation. Describe how bile duct obstruction can cause a tendency to bleed.

13. Define the following terms: thrombocytopenia, hemophilia, thrombus, embolus, thrombosis, embolism.

14. What conditions can lead to abnormal clot formations?

**NOTE:** refer to lab notes for information concerning the following objectives

15. Distinguish between antigens and antibodies. What is agglutination? Explain the basis of ABO blood types. Name the agglutinogens (antigens) and agglutinins (antibodies) found in each of the following blood types: A, B, AB, and O.
16. What is the main concern when blood is transfused from one individual to another? NOTE: Even though your text introduces you to the concept of universal donors (Type O) and universal recipients (Type AB), you should realize that a number of other factors (agglutinogens or antigens) have been discovered on red blood cells and before any blood is transfused it should be cross matched for compatibility.

17. Distinguish between Rh-positive and Rh-negative blood. Describe how an Rh-negative person receiving Rh-positive blood from a transfusion or during childbirth may become sensitized to Rh-positive blood. Describe the consequences of an agglutination reaction. Define erythroblastosis fetalis.

Chapter 13 THE CARDIOVASCULAR - THE HEART

1. State the major functions of the cardiovascular (circulatory) system.

2. Describe the location of the heart in the body. What is the mediastinum (review this)? The apex? Describe the pericardium and indicate its function.

3. Compare the layers of the cardiac wall (epicardium, myocardium, endocardium).

4. Name the four chambers of the heart and state the relative location of each. Name the blood vessels that are connected to each of the chambers of the heart. Name the wall that separates both atria, both ventricles, an atrium and a ventricle. Locate, name, and know the functions of the four valves of the heart. Also, be familiar with the location and function of the papillary muscles and chordae tendineae. Be able to identify (on a model, a labeled diagram, or on a fresh heart) all of the structures discussed in this objective. Why can your heart be called a "double pump"?

REFER TO LAB NOTES FOR OBJECTIVES 5-8

5. Describe the flow of blood from the venae cavae to the aorta -- this means that you should be able to trace the flow of blood through all of the chambers, valves, and major blood vessels associated with the heart -- no mistakes allowed.

6. Distinguish between the pulmonary circuit and systemic circuit. Be able to state the oxygen and carbon dioxide content (higher or lower) of the blood as it passes through the left and right sides of the heart and the pulmonary and systemic circulation. On a diagram of the heart, color the blood with lower oxygen content (venous blood) blue and color the blood with higher oxygen content (arterial blood) red. What important gaseous exchanges occur in the lungs? Compare this to the gaseous exchanges that are occurring in the tissue capillaries.

7. The right ventricle of the heart pumps blood to and through only one pair of organs. Which one? What part of the heart pumps blood through the systemic circulation, that is, to and through all organs other than the lungs? All blood returns from the systemic circulation to what part of the heart?

8. Explain the origin of heart sounds. Distinguish between the terms systole and diastole.

9. Describe the anatomy of the cardiac conduction system. Briefly outline the physiology of the conduction system. NOTE: The nature and interpretation of the electrocardiogram (ECG), and more detailed cardiovascular physiology will be presented in Biology 106.

10. Distinguish between sympathetic and parasympathetic effects on the heart. What neurotransmitter does each division of the autonomic nervous system release? Where is the cardiac center located?


12. Describe some of the major characteristics of, and differences among, arteries, arterioles, veins, venules, and capillaries. Distinguish between arteries and veins on the basis of blood flow toward or away from
the heart. Describe the structure and function of capillaries. Describe the factors which influence exchange between a capillary and its surrounding tissue fluid. What special name is given to the simple squamous epithelium that lines all blood vessels? Why are valves abundant in the veins and not in the arteries. What is vasoconstriction? Vasodilation?

13. What is meant by blood pressure? Distinguish between systolic and diastolic blood pressure. Indicate a normal arterial blood pressure for a young adult.

14. Explain what causes the pulse. Try to locate your pulse in some of the areas indicated in the text.

15. What is cardiac output? Describe the relationship between cardiac output and blood pressure. How is blood pressure affected by: blood volume? peripheral resistance? viscosity? *Control of blood pressure will be covered in Biology 106.

16. Describe the location and function of the coronary arteries. What is a coronary thrombosis? What is meant by the term myocardial infarction. Trace the flow of blood from the coronary arteries, back to the right atrium.

17. **Major arteries of the body.** Learn the major arteries of the body listed below. You should be able to identify these arteries via a diagram or description. Many of these vessels will be identified in the fetal pig or on torsos in the lab. Also, learn the general regions, if it is a paired vessel is it the right or left (indicate in the name), and organs supplied by these blood vessels.

- aorta (ascending, arch, descending)
- coronary arteries (right and left)
- thoracic and abdominal aorta
- intercostal
- brachiocephalic (innominate)
- subclavian
- axillary (a continuation of the subclavian into the axillary region)
- common cartotid
- internal carotid
- external carotid
- renal
- pulmonary
- femoral
- brachial
- radial
- external iliac
- ulnar
- internal iliac
- coronary arteries (right and left)
- subclavian
- internal jugular
- external jugular
- inferior vena cava
- renal
- common iliac
- internal and external iliac
- femoral
- common carotid
- radial
- external iliac
- ulnar
- internal iliac
- coronary sinus
- median cubital--in the bend of the elbow, frequently used as a site for venipuncture
- pulmonary
- hepatic portal--transports blood from the digestive tract to the liver
- great saphenous--a long superficial vein that travels along the medial side of the lower leg and thigh and joins the femoral in the groin--often used in coronary bypass

*Using the arteries and the veins, be able to trace the path of blood flow from one region to another. (i.e. from axilla to thigh). Both for lecture and laboratory examinations or quizzes.

18. **Major veins of the body.** Learn the following major veins of the body. Know what area of the body has capillaries emptying into each and what vessel (or heart chamber) each leads to. Know right or left vein.

- cardiac veins
- superior vena cava
- brachiocephalic (both right and left)
- subclavian
- internal jugular
- external jugular
- inferior vena cava
- renal
- common iliac
- internal and external iliac
- femoral
- coronary sinus
- median cubital--in the bend of the elbow, frequently used as a site for venipuncture
- pulmonary
- hepatic portal--transports blood from the digestive tract to the liver
- great saphenous--a long superficial vein that travels along the medial side of the lower leg and thigh and joins the femoral in the groin--often used in coronary bypass

19. Name the region of the body or organ that receives blood from the following arteries: pulmonary, coronary, common carotid, subclavian, renal, femoral, and internal carotid.

20. What is the name of the main artery of the thigh? Of the upper arm? Of the thumb side of the lower arm? What are the major neck arteries called? What artery is used for taking blood pressure?
21. Name the region of the body or organ from which blood is drained into the following veins: superior vena cava, subclavian, internal jugular, pulmonary, renal, inferior vena cava, and femoral. What are varicose veins?

22. How does the hepatic portal system differ from most venous pathways? What is the importance of the hepatic portal vein?

23. As a review, for each of the following name a vessel that "comes next" according to blood flow:
   - common carotid artery
   - internal jugular vein
   - subclavian vein
   - renal vein
   - femoral vein
   - common iliac vein
   - brachial artery
   - subclavian artery
   - cardiac vein
   - brachiocephalic vein
   - brachiocephalic artery
   - axillary artery

Chapter 20 PREGNANCY, GROWTH, AND DEVELOPMENT
(Just areas concerning fetal blood and circulation in this chapter)

1. Describe the location and function of the following fetal circulatory adaptations: umbilical vein, ductus venosus, foramen ovale, ductus arteriosus, umbilical arteries. How does fetal circulation allow blood to bypass the lungs? What characteristic of the fetal lungs tends to shunt blood away from them?

2. Trace the flow of blood from the placenta to various body areas (i.e., brain, arm, etc.) of the fetus and back to the placenta.

3. Describe the circulatory changes that occur in the newborn. What is the fate of the foramen ovale? The ductus arteriosus? The ductus venosus?

4. Practice tracing blood flow from one body area to another. Example: From left thigh to right side of brain.

Chapter 14 LYMPHATIC SYSTEM

1. Describe the general functions of the lymphatic system. Describe the following structures that make up the lymphatic system: lymphatic capillaries, lymphatic vessels, lymph nodes, lymphatic trunks (don't memorize all of the different trunks), thoracic duct, and right lymphatic duct. Where do the latter two ducts empty into the circulatory system?

2. Indicate major areas of the body drained by the thoracic duct and right lymphatic duct.

3. Describe how interstitial fluid (tissue fluid) and lymph are formed and explain the functions of lymph. What is one major difference between blood plasma and interstitial fluid in terms of composition?

4. Describe the major forces that are responsible for the flow of lymph.

5. Indicate how edema could be related to the lymphatic system.

6. What are the major functions of the lymph nodes? Name two important types of cells found in lymph nodes. Note that the lymph nodes are particularly abundant in the axillary, inguinal abdominal, and cervical regions. Describe lymph/angitis. What is lymph/adenitis?

7. Axillary lymph nodes are sometimes removed during a mastectomy if it is likely that cancer cells have spread from the breast to these nodes. What may happen to tissues distal to the axillary region?
8. Describe the location and function of the thymus. What hormone is believed to be secreted by the thymus?

9. Describe the location of the spleen. What are the general functions of the spleen?

Chapter 16  THE RESPIRATORY SYSTEM

1. Describe the general functions of the respiratory system. Name the major respiratory organs. Distinguish among: breathing, external, internal and cellular respiration.

2. Describe the anatomy of the nasal cavity. Include in your description the following structures: nostrils (external nares), nasal septum, and nasal conchae (turbinates). Explain how the nasal cavity functions in modifying incoming air.

3. Name and describe the locations of the sinuses, and indicate their function.

4. What are the three anatomical subdivisions of the pharynx? (Refer to the chapter on the digestive system.) Name all of the structures found in, and cavities which open into, each area of the pharynx.

5. Describe the location of the palatine, pharyngeal, and lingual tonsils. What are tonsils? (Refer to the chapter on the digestive system.)

6. Describe the structure of the larynx. Know the thyroid, and epiglottic cartilages (the epiglottis is considered part of the larynx). Distinguish between the false vocal cords and true vocal cords (folds). How do the vocal cords function to produce sounds? Define the glottis. What is the condition of the glottis during breathing?

7. Describe the structure and function of the trachea. Why are the C-shaped rings important?

8. Describe the structure of the bronchial tree. Mention the following structures: left and right bronchi, secondary bronchi, bronchioles, alveolar ducts, and alveoli? How do bronchioles and bronchi differ? Why are right lung infections more common than left?

9. Describe the location and structure of the lungs. Distinguish between visceral pleura and parietal pleura. What is the function of the serous fluid within the pleural cavity? How many lobes in each lung?

10. Describe the major events that occur during inspiration. Also, describe the sequence of events that takes place during expiration. What force is responsible for normal expiration?

11. Where is the respiratory center located? What chemical factors affect breathing? NOTE: The physiology of the respiratory system will be covered in detail in Biology 106.

12. Describe the structure of the respiratory membrane. What causes O₂ and CO₂ to move across the respiratory membrane?

13. How is O₂ transported from the lungs to the body cells? Why is carbon monoxide (CO) toxic? What is the major stimulus of the respiratory center?
Chapter 17. **URINARY SYSTEM**

1. List the major functions of the urinary system.

2. Name the organs of the urinary system and list their general functions.

3. Describe the location of the kidneys. Which kidney usually lies a little lower than the other? What is meant by the term retroperitoneal? What holds the kidneys in position?

4. Describe the internal macroscopic structure of the kidney and include the following: cortex, medulla, renal pyramids, papillae, renal pelvis, major calyces, and minor calyces.

5. Name the basic structural and functional unit of the kidney and indicate (approximately) how many are present in each kidney.

6. Sketch and label a single nephron and its associated blood vessels. Include the following: glomerulus, Bowman's capsule, afferent arteriole, efferent arteriole, peritubular capillary, proximal convoluted tubule, descending limb of the loop of Henle, ascending limb of the loop of Henle, distal convoluted tubule, and the collecting duct. What is the renal corpuscle?

7. Distinguish between nephritis, glomerulonephritis, and pyelonephritis.

8. Describe the three major processes involved in urine formation.

9. How is the glomerulus and Bowman's capsule adapted to facilitate filtration. Describe the process of glomerular filtration. What is hydrostatic pressure and how is it related to the rate of filtration? Compare the composition of the glomerular filtrate to plasma. What is one major difference between the composition of plasma and glomerular filtrate?

10. What is the glomerular filtration rate for both kidneys per minute and in 24 hours? What happens to most of the filtrate that passes through the renal tubules. Could a renal calculus (kidney stone) that completely blocks one of the ureters stop filtration? If so how?

11. Explain how glomerulonephritis, proteinuria, hypoproteinemia, and edema are all related.

12. Compare the concentrations of glucose, urea, and uric acid in plasma, glomerular filtrate, and urine (See table in text). Explain these concentrations.

13. What is the role of the enzyme renin in glomerular filtration, sodium and water balance, and blood pressure? What type of stimuli causes the release of renin?

14. Describe the process of tubular reabsorption. How is the peritubular capillary adapted for reabsorption? What mechanisms are responsible for reabsorption of solutes from the glomerular filtrate?

15. Explain why active transport mechanisms have limited transport capacities.

16. Describe the reabsorption of glucose in the nephron. What happens when the plasma glucose concentration exceeds the renal plasma threshold. What conditions can cause glucosuria (or glycosuria)?
17. Describe the reabsorption of sodium (Na+), negatively charged ions (e.g. C1-), and water. Indicate whether the processes involved for each substance are active or passive transport mechanisms. Explain how sodium reabsorption affects water reabsorption. Review the effect of renin on aldosterone secretion and the resultant increase in tubular reabsorption of sodium ions. In the unit on cell biology we discussed terms such as hypotonic (low osmolarity) and hypertonic (high osmolarity)--review these osmotic concepts.

18. Discuss how antidiuretic hormone (ADH) regulates the urine concentration and volume. Where is this hormone produced? Released? What are its specific targets and action? Discuss how this hormone would help to conserve body fluids if you were deprived of water for a long period of time. Discuss how this hormone would help to eliminate excess fluid from the body if you consumed large quantities of water in a short period of time.

19. What type of metabolism is responsible for the formation of urea? For the formation of uric acid? Why is the urea concentration so great in urine?

20. Define tubular secretion. Name several substances that are secreted by the nephron. What substance secreted by the kidney would have a major impact on the body's acid-base balance?

21. List the normal constituents of urine. What factors affect the volume of urine produced each day?

22. Describe the structure of the ureter. How is urine moved from the renal pelvis to the bladder?

23. Describe the location, structure, and function of the bladder. What structures are found at the three angles of the trigone? What type of muscle is found in the muscular coat of the bladder? What kind of autonomic nerve fibers supply the detrusor muscle? What is cystitis? State two reasons why it is more common in women than in men. Why can cystitis, if untreated, lead to pyelonephritis?

24. Describe the external urethral sphincter. Describe the events of micturition. What is meant by an automatic bladder?

Chapter 18. WATER AND ELECTROLYTE BALANCE

1. Distinguish between the ICF (intracellular fluid compartment) and the ECF (extracellular fluid compartment). What percentage of total body water is assigned to each compartment? List as many examples of ECF as you can.

2. What electrolytes are in high concentration in extracellular fluid? In intracellular fluid? How does the concentration of protein vary in different body fluids--compare ICF, plasma, interstitial fluid, and lymph.

3. What factors control the movement of water and electrolytes from one fluid compartment to another? How would an increasing concentration of sodium in the interstitial fluid and plasma affect the net movement of water between the ECF and the ICF? What would happen to cells that help comprise the ICF?

4. What is meant by water balance? What is water of metabolism?

5. Where is the thirst center located? What mechanism stimulates fluid intake? What mechanism inhibits it?

6. By what route(s) is water lost from the body? What term is applied to water loss that occurs due to diffusion of water through the skin?

7. Discuss the role of the hypothalamus and ADH in regulating water balance. What are osmoreceptors?
8. Name several diuretics. How does alcohol promote diuresis? How can a diuretic that inhibits the reabsorption (active transport) of sodium promote increased urine output?

9. What electrolytes are most important to cellular functions? By what routes are electrolytes lost from the body? What is the most abundant ion in the ECF? In the ICF?

10. Describe how aldosterone regulates sodium and potassium ion concentrations in the body fluids. Additional information can be found in the chapter on the endocrine system.

11. What hormones regulate calcium ion concentration in the body fluids?

12. The concentration of hydrogen ions in body fluids (or pH) is regulated primarily by (1) ___________. (2) ___________, and (3) __________.


14. What is the first line of defense against shifts in pH? What are the differences between the chemical and physiological buffer systems?

15. What is the pH of arterial blood? A pH of 7.6 would represent a state of ___________. A pH of 7.2 would represent a state of ___________.

For these last chapters, omit any objectives marked with ** if time does not permit.

Chapter 11 THE ENDOCRINE SYSTEM

1. Compare the general functions of the endocrine system with those of the nervous system. How do these systems differ in the way they act?

2. Distinguish between endocrine glands and exocrine glands. Cite 5 examples of exocrine glands.

3. Discuss the interrelationships between hormones, target tissues, and receptors.

4. What endocrine glands are located in the following parts of the body: abdominal cavity, cranial cavity, mediastinum, neck, and pelvic cavity.

5. **What are prostaglandins?

6. State three general ways hormone concentration may be regulated. Describe a negative feedback system. Explain two mechanisms involving the nervous system that help to control hormonal secretions.

7. Describe the location and structure of the pituitary gland. What part of the brain is connected to the pituitary gland via the pituitary stalk. Explain how the hypothalamus controls the release of hormones from the anterior and posterior lobe. How do releasing factors (hormones) get from the hypothalamus to their target tissue in the anterior pituitary gland?

8. Name the six hormones secreted by the anterior pituitary gland and state the function(s) of each. What is a gonadotropin?

10. Explain how thyroid-stimulating hormone (TSH) secretion is regulated.

11. Explain how the secretion of ACTH is controlled.

12. Name the hormones secreted by the posterior pituitary and state the function or functions of each. Review how the osmoreceptors in the hypothalamus help to maintain water balance in the body. What is diabetes insipidus? (Review your notes from the urinary system.)

13. Describe the location and structure of the thyroid gland. Name three major hormones secreted by the thyroid gland, state their functions, and indicate the source of control. **Describe hypothyroidism (cretinism) and hyperthyroidism (Grave's disease).

14. Where are the parathyroid glands located? Describe the function of parathyroid hormone (PTH). What controls the secretion of the parathyroid glands? **Describe what happens in hyperparathyroidism and hypoparathyroidism. **What is tetany and what can cause it?

15. State the location of the adrenal glands. Describe the two portions of the adrenal gland. What portion is intimately associated with the sympathetic division of the ANS?

16. Name the hormones secreted by the adrenal medulla. What effects are produced by these hormones? Describe how stress can lead to increased release of epinephrine to prepare the body for "fight or flight".

17. Name the three groups of hormones secreted by the adrenal cortex. Give an example of a hormone in each group.

18. What is the function of mineralocorticoids (e.g. aldosterone)? What mechanism controls the secretion of aldosterone?

19. Describe two major functions of the glucocorticoids, e.g. cortisol (hydrocortisone). How do the glucocorticoids cause an increase in blood glucose concentration? How does cortisol affect inflammatory reactions? Describe the control of the adrenal cortex hormones (namely, the glucocorticoids like cortisol). What kinds of clinical situations can be treated with cortisol and related compounds?

20. What is the major type of sex hormone secreted by the adrenal cortex? What are some possible functions of these hormones in females?

21. **Describe Addison's disease and indicate the cause. Why can this be fatal if left untreated?

22. **Describe Cushing's syndrome and indicate its cause.

23. Why is the pancreas called a dual gland? Name the endocrine portion of the pancreas.

24. What is the function of glucagon and what regulates its secretion?

25. What is the function of insulin? How is insulin secretion regulated? Describe the metabolic effects of untreated diabetes mellitus. Name two forms of diabetes. What causes acidosis in untreated diabetes? What are some predisposing factors toward development of diabetes?

26. **Name a hormone that is secreted by the pineal gland.

27. Where is the thymus gland located? Name a hormone secreted by the thymus. What is the function of the thymus?
Chapter 19  REPRODUCTIVE SYSTEM

NOTE: Most of this chapter is dealt with in the lab. Hormonal control will be discussed in lecture.

1. Describe the descent of the testes. What is the inguinal canal? What structures make up the spermatic cord? Describe the condition called cryptorchidism.

2. Describe the structure of a testis. Mention the seminiferous tubules, germinal epithelium, and interstitial cells (cells of Leydig). Indicate the functions of these structures.

3. What part of the spermatozoon (sperm cell) carries the genetic material? Indicate the normal number of chromosomes in human somatic (body) cells. How many chromosomes are carried by mature human sex cells (gametes) -- egg cells and sperm cells?

4. Define spermatogenesis and oogenesis. What is the most significant result of meiosis in terms of chromosome number?

5. Describe the epididymis and explain its function. Trace the path of a vas deferens (pl. vasa deferentia) from the epididymis to the ejaculatory duct.

6. On a diagram or model, locate the seminal vesicles and describe the composition of their secretion.

7. Describe the location of the prostate gland. What is the nature of its secretion. What changes in the prostate usually occur in older males?

8. On a diagram or model, locate the bulbourethral (Cowper's) glands and explain the function of their secretion.

9. What are the characteristics of seminal fluid? What is the average number of sperm cells present in seminal fluid per ml? Per ejaculation? Why is such a large number necessary?

10. Describe the structure of the penis. Mention the following structures: corpora cavernosa, corpus spongiosum, glans penis, external urethral meatus (urinary meatus), and the prepuce. What is circumcision?

11. Explain the mechanism that produces an erection of the penis. Distinguish between emission and ejaculation.

12. What initiates the changes associated with male sexual maturity? By means of a flow-diagram, show the mechanism by which the hypothalamus controls the maturation of sperm cells and the development of male secondary sexual characteristics. Define GnRH and gonadotropins. Provide specific examples of gonadotropins including their abbreviations.

13. Describe the male secondary sexual characteristics.

14. Explain how the secretion of male sex hormones (e.g. testosterone) is regulated. Discuss the concept of negative feedback control in this regulation. Construct a diagram to show the interplay between the testis, the hypothalamus, the pituitary, and the different hormones involved in negative feedback control.

15. Be able to locate and name (via diagram, model, or description) the primary and accessory organs of reproduction in the female. Also, be able to relate functions to these structures.

16. Describe the location of the ovaries. Discuss how a follicle matures. Name the hormone that stimulates maturation of the follicles. What causes ovulation? Describe oogenesis. What is the significance of unequal cytoplasmic division during meiosis? How long does oogenesis take?
17. Describe the location, structure, and function of the uterine (fallopian) tubes (or oviducts).

18. Describe the location and basic structure of the uterus. Include its position in relation to the bladder, rectum, and vagina. Distinguish between the body and cervix, the endometrium and myometrium. What is the function of the uterus (womb)?

19. Describe the structure and location of the vagina. Relate its position to the rectum, urethra, and urinary bladder.

20. On a diagram or model, identify the following structures of the vulva (external genital organs in the female): mons pubis, clitoris, urethral orifice (urinary meatus), labia minora, labia majora, hymen, vaginal orifice, vestibule. Also, identify the perineum. What is the male counterpart of the clitoris? What type of tissue is common to both the penis and clitoris?

21. What events result from parasympathetic stimulation of the female reproductive organs during sexual stimulation?

22. Compare and contrast the functions of the male and female urethra. What anatomic fact explains the ability of some microorganisms to reach the abdominal cavity of the female via the genital tract?

23. What factors initiate sexual maturity in a female? List the female secondary sexual characteristics that are caused by estrogen. What is the function of androgen in a female? Where does female androgen come from?

24. Discuss the major events of the female reproductive cycle (menstrual cycle). Correlate changes that occur in the uterus, ovary, pituitary, and hypothalamus. Include the use of the following terms in your discussion: menstrual flow, proliferative phase, secretory phase, ovulation, FSH, LH, GnRH, ovarian follicles, estrogens, corpus luteum, and progesterone.

25. What is the function of progesterone? Make sure that you understand the functions of FSH and LH. What appears to be responsible for ovulation? What causes the menstrual flow -- include any significant hormonal changes. Explain how oral contraceptives are believed to prevent pregnancy.

26. What is menopause? What are some of the physical and hormonal changes associated with menopause?

27. ** Describe the structure of the breast. Include terms such as: areola, adipose tissue, alveolar glands, ducts, nipple, suspensory ligaments (Cooper's ligament).

** Chapter 20 PREGNANCY, GROWTH, AND DEVELOPMENT

1. Describe how male and female sex cells are transported within the female reproductive tract. ** What role do prostaglandins potentially play in this process? What is the effect of high estrogen concentrations on the uterine and cervical secretions (cervical mucus)? How does this affect sperm transport and survival?

2. How long is the human egg viable following ovulation? How long can spermatozoa live in the female reproductive tract? How do these facts relate to the period of fertility in the human female? Is this a brief or long period of time?!

3. Where does fertilization usually occur? What name is applied to the first cell of the future offspring? How many chromosomes does this cell have?
4. **Describe early embryonic development starting with the zygote and ending with implantation. Define cleavage and mention the morula and blastocyst. How does an embryo become implanted in the uterine wall?**

5. **Describe the mechanism that is responsible for maintaining the uterine wall (endometrium) during pregnancy. Show, via a graph, the changing concentrations of HCG, estrogen, and progesterone throughout the period of pregnancy. What is the source of hormones that sustain the uterine wall during the latter part of pregnancy? Cite one important effect that placental progesterone has on the smooth muscle of the myometrium. What effect does high concentrations of estrogen have on the ligaments of the symphysis pubis?**

6. **What major events occur during the embryonic stage of development? Name the three primary germ layers. The nervous system, epidermis, hair, and nails develop from ______. Muscle tissue, bone, bone marrow, blood, and various connective tissues develop from ______. The epithelial linings of the digestive and respiratory tract develop from ______.**

7. **Describe the chorionic villi. What is their function? What substances are exchanged between the embryonic blood and the maternal blood via the placenta?**

8. **Describe the following embryonic membranes and indicate their functions: amnion, chorion, and yolk sac. Define teratogens and give several examples. Define fetus.**

9. **Describe the hormonal control of the mammary glands before pregnancy, during pregnancy, and following childbirth. Discuss the functions of estrogen, progesterone, placental lactogen, prolactin, and oxytocin. What is colostrum? What happens if milk is not removed from the breast regularly following birth?**

10. **Define the neonatal period of development. Why must the first breath of an infant be particularly forceful? What does a newborn use for an energy supply during the first few days after birth? How do the kidneys of a newborn differ from those of an adult?**

11. **Know the following clinical terms related to growth and development: abortion, amniocentesis, dizygotic twins, ectopic pregnancy, fetal alcohol syndrome, monozygotic twins, teratology.**