

Human Anatomy

Learning objectives for candidates preparing for the Wits Additional Placement Test (WAPT) – 2023

REFERENCES

Textbooks

- Marieb EN, Hoehn K, Human anatomy & physiology (11th ed.) San Francisco: Pearson/ Benjamin Cummings

NOTE: the previous editions of this book will also give the information required.

Additional histology resources

<https://www.histologyguide.com/>

Virtual microscopy laboratory. Histology Guide teaches the visual art of recognizing the structure of cells and tissues and understanding how this is determined by their function.

<https://histology.medicine.umich.edu/full-slide-list>

Virtual slide list. These two links will supplement the above textbook information, increase your understanding and aid you in fulfilling the histology objectives below.

Additional gross anatomy resources

<http://www.anatomyatlases.org/atlasofanatomy/index.shtml> (an online atlas)

<http://www.anatomicalterms.info/> (good online anatomical term dictionary)

Additional embryology resources

http://www.med.unc.edu/embryo_images/

THE DETAILED OBJECTIVES

NOTE:

- There may be some overlap/ duplication between sections within Anatomy, and between Physiology, Anatomy and Molecular Medicine
- It is strongly recommended that you study the anatomy and physiology of the same system at the same time.

Orientation to the Human Body

- Briefly describe the levels of structural organization in the body
- Define the meaning of the Latin and Greek terms commonly used to designate body regions
- Define the different fields of study within the anatomical sciences (embryology, histology and gross anatomy)
- Define the anatomical terms: position and relation, and anatomical planes
- Compare the dorsal and ventral body cavities in terms of position and contents
- Describe the subdivisions of the ventral body cavity including their boundaries, contents and further subdivisions and membranes
- Define the nine regions and four quadrants of the abdomen
- List the organs located in each abdominal quadrant

Cells and Tissues

- List the special characteristics of epithelium and relate these to function
- Describe the classification of 'covering/ lining' epithelium
- State the defining histological features of each class of epithelium, provide examples of each and relate these features to function
- Recognise the histologic appearance of basic epithelium types
- List the differences in structure and function between 'covering/ lining' epithelium and 'glandular epithelium'
- Classify the endocrine and exocrine glands in terms of structure and function, and give examples for each class
- List the components of connective tissue and give the function of each component
- Classify the basic types of connective tissue according to their components, giving an example of each type
- Explain how the different structures of the different types of connective tissue relate to their function
- List the specialized forms of connective tissue (bone and cartilage) and describe the histological classification and functional properties of each
- List the histological features of muscle tissue
- Briefly describe the histological features of the 3 types of muscle tissue

The Skin

- Briefly describe the layers of the epidermis (epithelium), dermis (connective tissue) and associated appendages
- List the major functions of the skin and relate these functions to its histological structure

The Skeletal System

- Classify bones using the gross anatomical classification, giving an example of each type
 - Name the anatomical parts of a long bone
 - Briefly describe the basic types of bone development/growth
 - Describe the microscopic anatomy of compact and spongy bone
 - Describe the functional importance of bone markings
 - Describe the bones of the skull
 - Identify the skull foraminae and list the structures passing through each foramen
 - List the bones which form each of the cranial fossae: Anterior fossa: frontal, sphenoid; middle fossa: sphenoid,
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- Describe the structure of the vertebral column
 - Describe the general structure of a vertebra and the regional features of cervical, thoracic and lumbar vertebrae and the sacrum
 - Describe the structure and function of an intervertebral disc
 - Define the terms and list rib numbers classified as 'true ribs' and 'false ribs'.
 - Describe the features of typical and atypical ribs, as well as the sternum
 - Describe the features of the bones of the pectoral girdle, arm and forearm
 - Name and identify the bones of the carpus
 - Describe the bones of the pelvic girdle, thigh and leg
 - Name and identify the bones of the tarsus
 - Describe the arches of the foot, listing the structures important in maintaining each arch

The Joints

- Classify joints using the gross anatomical classification, giving an example of each type
- Describe the features of a synovial joint
- Define the anatomical terms of movement
- Describe the ankle, knee, hip, wrist, elbow and shoulder using the following headings: classification, articular surfaces, jointcapsule, ligaments, movements at the joint, blood and nerve supply, factors aiding stability

The Muscular System

- List the histological features of muscle tissue
- Briefly describe and identify the histological features of the 3 types of muscle tissue (skeletal, smooth and cardiac muscle)
- Describe the functional unit of muscle at the microscopic level, the sarcomere
- List the criteria used in naming muscles and provide examples to illustrate each criterion
- List the general functions of muscles and describe how functional muscle groups interact with each other to produce movement
- Name the muscles of the following regions giving the action and nerve supply of each.
 - Muscles of the head: muscle of mastication
 - Muscles of the anterior neck and throat: suprahyoid muscles, infrahyoid muscles, anterolateral neck muscles
 - Muscles of the vertebral column
 - Muscles of the thorax; superficial muscles of the anterior and posterior thorax
 - The diaphragm
 - Muscles of the abdominal wall
 - Muscles of the pelvic floor and perineum: muscles of the pelvic and urogenital diaphragms.
 - Muscles crossing the shoulder joint
 - Muscles crossing the elbow joint
 - Muscles of the forearm
 - Muscles crossing the hip and knee joints
 - Muscles of the leg
- Describe the formation of the rectus sheath.

The Central and Peripheral Nervous Systems

- Define the following terms: grey matter, white matter, tract, nerve, nucleus, ganglion, decussation, cortex, central nervous system, peripheral nervous system, autonomic nervous system and somatic nervous system
- List the components of the central and peripheral nervous systems
- List the support cells of the nervous system (neuroglia) giving the function of each
- List the components of a neuron giving the function of each component
- Classify neurons as per their function and histological structure
- Describe the process of myelination
- Describe the ventricular system
- Name the important sulci, gyri and fissures used to delineate the different lobes of the cerebral hemispheres
- Describe the topographical organization from the medial to the lateral side of the primary motor and sensory cortex that represent different body areas (motor and sensory homunculi)
- Describe the position and function of the functional areas of the cerebral cortex
- Name the subdivisions of the diencephalon, giving the function of each
- Name the subdivisions of the brainstem, stating the position and function of each
- Describe the structure and function of the cerebellum
- Identify the position of the following parts of the brain on images: the cerebral hemispheres, thalamus, hypothalamus, internal capsule, basal nuclei, components of the brainstem, optic chiasm and pituitary gland
- Name and describe the features of the 3 meningeal layers of the brain and spinal cord
- Define the term 'dural venous sinus'
- State the formation, circulation and absorption of cerebrospinal fluid
- Define the blood-brain barrier
- Describe the longitudinal and cross-sectional anatomy of the spinal cord, including the position of the important ascending and descending tracts
- List the 12 cranial nerves (both by name and roman numeral) and state the major anatomical and functional

components of each

- Describe the cutaneous and motor innervation of the face
 - Describe the formation of a spinal nerve and the general distribution of its rami
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| <ul style="list-style-type: none">▪ Name the major plexuses and list the distribution and function of the peripheral nerves arising from each plexus▪ Define the terms dermatome, myotome and nerve plexus |
| <ul style="list-style-type: none">▪ Define Hilton's law▪ Classify and list the different types of sensory receptors in the body, and state their location and the stimuli they record▪ List the anatomical differences between the autonomic and somatic nervous systems▪ Describe the anatomy of the parasympathetic and sympathetic divisions of the autonomic nervous system |

The Special Senses

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| <ul style="list-style-type: none">▪ Name the divisions of the ear, and describe the features and give the function of each part▪ Describe the structure of the eyeball and accessory structures of the eye▪ List the elements of the visual pathway▪ State the location of the olfactory epithelium and briefly describe its microscopic features and neurological connections▪ Briefly describe the location and types of taste buds, their microscopic features and their neurological connections |
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The Endocrine System

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| <ul style="list-style-type: none">▪ Describe the morphology and anatomy of the hypothalamic-hypophyseal system▪ Provide and identify the divisions, position, anatomical relations and blood supply of the pituitary, thyroid and adrenal(suprarenal) glands▪ Give a brief description of the histological features the pituitary, thyroid and adrenal/ suprarenal glands (cortex and medulla) and the endocrine pancreas |
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Blood

NOTE: Blood is considered as a specialized form of connective tissue.

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| <ul style="list-style-type: none">▪ List the basic cellular components of blood and identify the basic histological features of the following mature blood cells: red blood cells, neutrophils, macrophages, lymphocytes |
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The Cardiovascular and Lymphatic Systems

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| <ul style="list-style-type: none">▪ State the normal anatomical position of the heart and list its important relations▪ Define the term 'pericardium' and name the anatomical parts of the pericardium▪ Name the layers of the heart wall▪ Name the chambers of the heart and the great vessels associated with each chamber▪ Describe the pulmonary and systemic circulations▪ Describe the coronary circulation including the origin, course and branches/ tributaries of the blood vessels▪ Name the heart valves and describe their location▪ List the histological features of cardiac muscle and relate these to function▪ Describe the conducting system of the heart by listing the structures through which an electrical impulse passes▪ List the three layers which form the wall of a blood vessel and give the function of each layer▪ Compare and contrast the structure of the walls of elastic arteries, muscular arteries, arterioles, capillaries, venules and veins and relate any differences to function▪ List, in order, major branches of the aorta and the superior and inferior vena cava▪ Describe the arterial supply and venous drainage of the following regions:<ul style="list-style-type: none">- The head and neck (including the brain)- The upper limb and thorax- The abdomen (name the artery which supplies each organ)- The lower limb▪ Describe the formation of the portal vein▪ List the components of the lymphatic system and state their functions▪ List the two main lymphatic vessels, describe their course and state their drainage areas▪ Describe the microscopic structure of a typical lymph gland▪ List the main groups of lymph nodes in the body▪ Briefly describe the location and structure of the spleen, thymus and mucosa-associated lymphatic tissue (MALT) |
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The Respiratory System

- Name the organs forming the respiratory passageway(s)
- Describe the location and function of the nose, paranasal sinuses, pharynx and larynx
- Describe the gross anatomical features of the trachea, bronchi, lungs and pleura
- List, in order, the divisions of the tracheobronchial tree
- Describe the blood supply and innervation of the lungs
- Describe the histological features of the trachea and alveolus
- Describe the structural (histological) changes which occur from the trachea to the alveoli and relate these changes to changes in function
- List the components of the blood gas barrier

The Digestive System

- Define the terms parietal peritoneum, visceral peritoneum, mesentery, lesser omentum and greater omentum, intraperitoneal and retroperitoneal
- Describe the general histological structure of each part of the alimentary canal
- Distinguish between organs of the alimentary canal and accessory digestive organs
- List the gross anatomical features of the oesophagus, stomach, liver and biliary tree, pancreas, small intestine and large intestine, including the appendix
- List the histological features of the oesophagus, stomach, small and large intestine noting differences between the different regions of these organs and relate these differences to function
- Describe the histology of a liver lobule
- List the histological features of the exocrine pancreas
- Briefly describe the number, types and microscopic features of the 2 sets of teeth

The Urinary System

- List the components of the urinary system
- Describe and identify the gross anatomy of the kidney and its coverings
- Describe the histological arrangement of the functional unit of the kidney, the nephron
- Describe the location and structure of the ureter, urinary bladder and urethra
- List and identify the histological features of the ureters and bladder

The Reproductive System

- Describe and identify the location and structure of the testes, penis, epididymis, ductus deferens, ejaculatory duct, seminal vesicles and prostate gland
- Describe the location and structure of the ovaries, uterine tubes, uterus and vagina
- Name the components of the female external genitalia
- Describe the histology of the ovary and endometrium with reference to the changes that occur during the female reproductive cycle

Embryology

- Define the terms cleavage, morula, blastocyst, trophoblast and inner cell mass
- Name the derivatives of the trophoblast and embryonic disc
- Describe placenta formation and list the functions of the placenta
- Describe the process of gastrulation and list the structures formed by the three primary germ layers
- Describe the process of neuralation
- Describe the fetal circulation

*While these are the examinable objectives for embryology, it is recommended that the entire section in *Human anatomy & physiology (Marieb EN, Hoehn K)* is studied to gain complete understanding.*