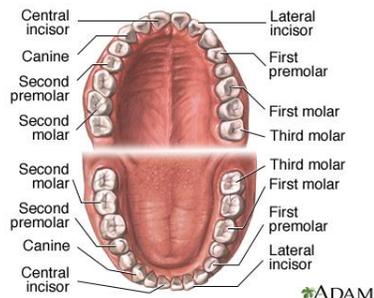




Study Guide OF ANATOMY

For BDS First year



Dr. Sonia Bashir



MESSAGE FROM THE PRINCIPAL

AVICENNA DENTAL COLLEGE



Prof. Dr. Sohail Abbas Khan
{MDS, Dip Op (Hons) BDS}

It is a matter of immense honour and privilege as the first Principal of Avicenna Dental College to welcome you to prospectively one of the finest dental institutes in the private sector of Pakistan. Avicenna Dental College is a private dental college, which aims to provide the finest dental education to dental undergraduate student in accordance with the latest trends in Medical Education, and to develop them to practice dentistry in the 21st century.

While educating dental students to become licensed, empathetic and competent professionals, Avicenna Dental College endeavours to educate students in a supportive environment in which they provide dental care for a diverse populace. In the times to come, we wish to transform our graduates into unfeigned teachers, researchers and consultants by starting post-graduation programs as well.

Avicenna Dental College aims to achieve an enterprising curriculum integrating the basic sciences with clinical experience while utilizing modern technological modalities.

In addition to the production of outstanding oral health professionals, we at Avicenna Dental College recognize our responsibility as a private dental institution to the citizens of the country in making the provision of oral the provision of oral health care available to those who are deprived of ready access.

I feel proud to lead this dental establishment such an inspiring time and hope all of you at Avicenna Dental College will share this pride and play your respective roles in materializing the dream of making this institution the premier dental educator in Pakistan.



MESSAGE FROM HOD, ANATOMY

AVICENNA DENTAL COLLEGE



Prof. DR. SONIA BASHIR

(M.B.B.S.,M.PHIL)

PROFESSOR /H.O.D.

The Anatomy curriculum has a balanced approach with a combination of dedicated lectures, dissections, and demonstration of cadavers, micro-study of individual organs and teacher-student interactions in the form of seminars and symposia. Lectures are made lively with the use of multimedia devices and students are divided into groups for better understanding & learning. The Dissection Hall (2,400 sq ft) with adjoining mortuary for 12 bodies, a well-equipped Bone bank, an Anatomy Museum and a separate Histology lab with slide preparation room facilitate the dissemination of knowledge among students and enable them to understand the concepts in an effective manner.

STUDY GUIDE OF ANATOMY FOR BDS

III. GENERAL ANATOMY:

Contents/ topics	Outcomes/ knowledge (the students should be able to know the)
1. Anatomical Terminologies	Definitions of various terminologies and their application. Basic concept of the movements at joints.
2. General aspects of bones	Classification, parts of bones, structure, growing end hypothesis, blood supply of adult and immature long bones. Types of epiphysis.
3. General aspects of Joints	Classification and structure of fibrous, cartilaginous and synovial joints. .
4. General aspects of muscles	Classification and general structure of the different muscles
5. General aspects of circulatory system	Classification and structure of different blood vessels. Types of circulation Various portal circulations in body, types of capillaries Types of anastomosis. General feature of lymphatic system
6. General aspects of the integumentary system	General features of epidermis and dermis. Appendages of skin. Langer's line and dermatoglyphics Dermatomes
7. General aspects of the	Classification and general features of neurons

central nervous system	Structure of typical spinal nerves Components and general features of CNS and PNS Autonomic nervous system.
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IV. Topic: GENERAL EMBRYOLOGY:

Contents	Outcomes/Knowledge
1. Introduction to Embryology.	1. Definition, descriptive terms in embryology, planes & sections. Significance of embryology, basic genetics & molecular regulation.
2. Male & Female Reproductive systems.	2. Structure & functions of testis, vas deferens, epididymis, ductus deferens, ejaculatory ducts, accessory glands & male external genitalia, ovaries, uterine tubes, uterus & uterine cycle, accessory glands.
3. Mitosis & Meiosis	3. Various phases of cell division, differences between mitosis & meiosis.
4. Gametogenesis	4. Spermatogenesis & spermiogenesis & their difference. Oogenesis & how it differs from spermatogenesis.
5. Transport of gametes & Fertilization	5. Sperm transport, capacitation, ovulation & ovum transport, phases of fertilization & its outcomes.
6. First week of development.	6. Cleavage & formation of morula & blastocyst. Beginning of implantation.
6. Second week of development.	6. Formation of bilaminar germ disc, amniotic cavity, primitive yolk sac, extraembryonic mesoderm, chorionic cavity, secondary yolk sac & completion of implantation.
7. Third week of development.	7. Gastrulation, development of notochord, trilaminar germ disc, organization of intraembryonic mesoderm, formation of intraembryonic coelom, formation of neural tube, formation of primitive CVS, vasculogenesis & angiogenesis, development of chorionic villi.
8. Fourth week of development.	8. The process of neurulation, folding of embryo, development of somites, organogenesis & derivatives of neural crest cells, ectoderm, mesoderm & endoderm.
9. Fifth to Eighth weeks of development.	9. Changes in the flexure of body, development of face, eyes, ears & limbs.

V. SPECIAL EMBRYOLOGY:

Contents	Outcomes/Knowledge
Development of Head and Neck: a. Pharyngeal arches	Developmental basis of six pharyngeal arches and their derivatives with specific blood and nerve supply
b. Pharyngeal pouches	Developmental basis of six pharyngeal pouches and their derivatives
c. Pharyngeal cleft and membranes	Components of pharyngeal apparatus and their derivatives
d. Development of Tongue	Developmental basis of the appearance of mesenchymal swellings as tuberculum impar, copula and hypobranchial eminence to form different parts of tongue with specific nerve supply
e. Development of Thyroid gland	Appearance of the thyroid diverticulum from ventral wall of foregut. Role of ultimobranchial body from 5 th arch
f. Development of Face	Development of face from frontonasal, maxillary and mandibular prominences
g. Development of Palate	Development of primary and secondary palate from intermaxillary segment and maxillary prominences
Development of Eye	Appearance of optic cup and optic vesicles, outer pigmented layer and inner neural layer of optic cup develops into retina, iris and ciliary body. Developmental basis of the cornea and sclera.
Development of Ear	Appearance of the otic placode as thickening of surface ectoderm. Ventral and dorsal division of the auditory vesicles and its derivatives.

VI. HISTOLOGY (GENERAL & SPECIAL):

Topics/ contents	Outcomes/knowledge

	(students should be able to)
1. CELL	<ol style="list-style-type: none"> 1. Recognize cell organelles, which are visible by regular light microscopy (Nucleus, nucleolus, basophilic rough endoplasmic reticulum) 2. Know different functions that are associated with different types of eukaryotic cell organelles. 3. Review the function and structure of the organelles involved. 4. Compare the three different cytoskeletal systems 5. Outline the histological features of plasma membrane, and correlating them with their function.
2. EPITHELIUM	<ol style="list-style-type: none"> 1. List the different types of epithelial cells and briefly discuss the location, structure and function of each type. 2. Describe the accessory structural features of epithelial cells such as microvilli, cilia and cell-to-cell contacts.
3. GLANDULAR EPITHELIUM	Distinguish between structure and function of exocrine and endocrine glands and give examples of each.
4. CONNECTIVE TISSUE	<ol style="list-style-type: none"> 1. List the classification of connective tissue and their major histologic features. 2. Describe the various connective tissue cells. 3. Describe the different components of the ECM and their microscopic features. 4. Give the characteristics of special connective tissue.
a. Cartilage	<ol style="list-style-type: none"> 1. Able to recognize the three major cartilage types (hyaline, elastic and fibrocartilage) in light microscopic sections and know where each type is found in the body. 2. Able to identify cells and structures in a section of cartilage (e.g. chondroblast, chondrocyte, lacuna, isogenous group, two types of matrix, the perichondrium, etc.). 3. Know the contents of cartilage matrix and understand the molecular basis for cartilage resilience. <p>Able to describe the process of chondrogenesis and know how cartilage grows</p>

b. Bone	<p>1. Able to describe, as well as recognize in microscope sections/photos, the process of intramembranous bone formation, including the process by which cancellous bone is converted into compact bone.</p> <p>2. Able to recognize these cell types: osteoblasts, osteocytes and osteoclasts. Know their role in the process of intramembranous bone formation and conversion of cancellous bone to compact bone.</p> <p>3. Able to recognize mature and immature (mottled or woven) bone.</p> <p>4. Understand the process of endochondral bone formation and know how a cartilage model is broken down and replaced by bone.</p>
5. MUSCLES	Understand the structural organization of the various types of muscles
6.CIRCULATORY SYSTEM	1.Compare and contrast the histological structure of arteries, arterioles, capillaries, venules, and veins
7. LYMPHATIC SYSTEM	<p>1. `Able to describe the organization and function of thymus, lymph nodes, spleen and tonsils.</p> <p>2. Discuss the cells of the immune system, how they function, and their relationship with the lymphatic system</p>
8.INTEGUMENTARY SYSTEM	<p>1. Able to identify principal layers of the skin (epidermis, dermis and hypodermis) at the light microscope level and know the principal functions of each layer.</p> <p>2. Able to identify the layers of the epidermis in thick and thin skin</p> <p>4. Able to identify eccrine and apocrine sweat glands, as well as sebaceous glands at the light microscope level.</p> <p>5. Identify the components of the pilosebaceous apparatus and know the structural and developmental relationship between each component and the epidermis of the skin.</p> <p>6. Describe the accessory structures of the skin and the functions of each.</p>
9.NERVOUS SYSTEM	<p>1. Name the two principal types of cells in the nervous system?</p> <p>2. Describe the functions of supporting cells. Specifically, describe primary function and location of neuroglia, Astrocytes, microglia, ependymal, oligodendrocytes, and Schwann cells.</p> <p>3. List and briefly discuss histological characteristics of neurons.</p> <p>5. Give the function of a neuron? Distinguish between cell body (perikaryon), dendrites, axon. What is the function and location of: chromatophilic substance (Nissl bodies), neurofibrils, axon hillock, axon collaterals,</p>

	<p>axon terminals (synaptic end bulbs), and neurotransmitters.</p> <p>6. Give the difference between the myelin sheath and the neurolemma (sheath of Schwann)? What is the function of the myelin sheath? What produces the myelin sheath of the peripheral nervous system? What are nodes of Ranvier?</p> <p>8. Using structural classification, describe the structure and give a location of multipolar, bipolar, and unipolar cells.</p>
<p>10. RESPIRATORY SYSTEM</p>	<p>1. Know the basic components of the conducting and respiratory portions of the system and describe distinctive structural features of each component related to particular functions in respiration.</p> <p>2. Know the types of cells present in the respiratory epithelium and their functions in respiration.</p> <p>3. Able to identify the trachea, on the basis of: epithelial cell types present, and Relative amounts of glands, cartilage, smooth muscles and connective tissue fibers present in the wall of the tubes.</p>
<p>11. GASTROINTESTINAL SYSTEM</p>	<p>1. Know the location and histological similarities and dissimilarities among the different types of oral mucosae (lining, masticatory, specialized).</p> <p>2. Know the histology of the tongue including the different types of papillae.</p> <p>3. Able to describe the layers in the wall of the digestive tract (mucosa, submucosa, muscularis (propria), and adventitia/serosa), and explain how they differ in the pharynx, esophagus.</p> <p>4. Know the histological differences in the pharynx and the upper, middle and lower portions of the esophagus.</p>
<p>Salivary Glands</p>	<p>1. Identify parotid, submandibular and sublingual salivary glands on the basis of histological appearance and by the types of secretion produced by each gland.</p> <p>2. Identify striated ducts of the salivary gland at the light and correlate the structural features of the constituent cells to the functions of these ducts.</p> <p>3. Know the localization of myoepithelial cells and nerves in relation to the acinar cells, and their role in secretory functions.</p>

<p>12. CENTRAL NERVOUS SYSTEM</p>	<ol style="list-style-type: none"> 1. Identify tissues in the nervous system (nerves, cell bodies and ganglia, and white vs. gray matter in the spinal cord, cerebellum, and cerebrum). 2. Describe the organization and understand some of the basic functions of regions of the: <ul style="list-style-type: none"> spinal cord (e.g. dorsal horn, ventral horn, lateral extension of the ventral horn, and dorsal nucleus of Clarke), cerebellum (e.g. molecular, Purkinje, and granule cell layers and the general interactions of the cells therein) cerebral cortex (e.g. layers I through VI, particularly pyramidal cells of layers III and V) 3. Observe ependymal cells of the choroid plexus, noting that these are the cells responsible for the production of CSF. 4. Observe the 3-layered organization of the hippocampus and dentate gyrus (archicortex) as opposed to the 6-layered organization observed in other regions of the cerebral cortex (neocortex).
<p>13. EYE</p>	<ol style="list-style-type: none"> 1. Understand the structural organization and functions of the various components of the eyelid and conjunctiva. 2. Name the three layers of the eye, and describe the components of each at the level of the retina, lens and iris, and cornea. <ul style="list-style-type: none"> Relate retinal detachment to embryonic development of the eye. 3. Explain the histological basis of glaucoma (including the source and path of flow of aqueous humor) 5. Describe the ordered structures of cornea and lens that allow them to be translucent and explain how opacity can develop under pathologic conditions. 6. Describe the fovea, optic disk, and where blood vessels are located in the retina.
<p>14. EAR</p>	<ol style="list-style-type: none"> 1. Know the structural differences between the outer, middle and inner ear and what their functions are. 2. Recognize them at the light microscope and EM levels. 4. Distinguish the auditory parts of the inner ear from those of the vestibular system. What are their roles in hearing and balance? 5. What are sensory hair cells? How do they differ (in appearance and function) from neurons of the spiral ganglion?

VII. TOPIC. NEUROANATOMY

Contents	Outcomes/Knowledge (The student should be able to)
1. Introduction to nervous system	1. Describe the major organization of the nervous system, anatomical terms and planes of section. 2. Explain the structure and function of neurons and glia 3. Describe the location/organization of grey matter and white matter in the CNS in general terms. <ul style="list-style-type: none"> • 4. Relate the three meningeal layers and the spaces between them
2. Spinal Cord	1. Describe the gross anatomy of the spinal cord and its relationship to the vertebral canal and the organization of blood supply to the spinal cord. 2. Identify the locations of the corticospinal tract, the posterior column-medial lemniscus system and the anterolateral system in a cross section of the spinal cord. 3. Identify the location of somatic sensory, visceral sensory, somatic motor and visceral motor neurons in the gray matter of the spinal cord. 4. Sketch the longitudinal course of the corticospinal tract, the posterior column-medial lemniscus system and the anterolateral system throughout the spinal cord and brainstem and demonstrate an understanding of somatotopic arrangement, site of crossing fibres, and modalities carried within these tracts. 5. Identify the meningeal layers around the spinal cord and relate these to the spaces they border with and define. Explain the functional importance of these spaces for clinical practice.
3. Brain stem	1. Describe the major surface markings, including cranial nerve roots, of the brainstem and how they relate to tracts and structures within the brainstem. 2. Compare and contrast the corticobulbar tract to the corticospinal tract. 3. Describe the functional anatomy of the ascending and descending medial longitudinal fasciculus (MLF). 4. Identify the cranial nerves involved in eye movements on the surface of the brainstem and identify their nuclei within the brainstem on cross sections. 6. Explain the underlying pathways and connections of horizontal eye movements for saccadic and pursuit movements as well as the vestibulo-ocular reflex.
4. Cerebellum	Understand the location of the cerebellar vermis, cerebellar hemispheres, anterior lobe, posterior lobe, and flocculonodular lobe To learn the basic anatomical organization

	<p>and functional roles of the cerebellum</p> <p>2. To understand the anatomical and chemical organization of the cerebellar cortex (cell layers, cell types, transmitters</p> <p>3. Know the blood supply of cerebellum</p> <p>4. Describe the function of cerebellum</p>
5. Diencephalon	<p>Describe the nuclei and connections of thalamus and epithalamus.</p> <p>2, Describe the nuclei and connections of hypothalamus and subthamamus.</p> <p>3. Describe the circumventricular organs of the brain</p>
6. Cerebrum	<p>1.Distinguish between the frontal, temporal, parietal, and occipital lobes of the cerebral cortex</p> <p>2. Describe the internal structure of the cerebrum.</p> <p>3. Describe the layers of the cerebral cortex.</p> <p>4. Describe the functional areas, their blood supply</p>
7. The basal nuclei and their connections	<p>Describe the basal Nuclei , their connections , and their functions and relate them to diseases commonly affecting this area of the nervous system</p>
8. Cranial nerves	<p>Learn the basic information regarding the motor and sensory nuclei of the cranial nerves, including their location and central connections</p>

9. Autonomic nervous system	Understand the structure, physiology, and pharmacology of the autonomic nervous system
10. Meninges of the brain and spinal cord	To learn the structure and function of the three meninges that surrounds the brain and spinal cord. Understand the venous sinuses with in the skull and see how the meninges contribute to their walls.
11. Ventricles and circulation of cerebrospinal fluid	Describe the parts and relations of ventricular system
12. Blood supply of the brain and spinal cord	1. Name the main blood vessels supplying the brain and spinal cord 2. Identify the area of cerebral cortex and spinal cord supplied by a particular artery 3. Describe the circle of Willis

VIII. REGION. HEAD & NECK:

Contents	Outcomes/Knowledge (The student should be able to)
A. HEAD	
1. Bones of skull	1. Composition & names.
2. External views of skull	2. Various views of skull like anterior, lateral, posterior, superior, inferior & interior fossae (cranial cavity). The foramina & structures passing through these foramina of skull.
3. Neonatal skull	3. Features, different fontanelles, their locations & significance.
4. The Meninges & Dural venous sinuses	4. Types of meninges their reflections, nerve supply. Paired & unpaired venous sinuses, their locations, relations & communications.
5. The orbital region	4. Eyelids, the muscles of eye lids & eye ball, movements & nerve supply. Lacrimal apparatus including lacrimal gland, ducts, lacrimal sac & their nerve supply.
6. The orbit	6. Boundaries, openings into orbital cavity, orbital fascia, nerves of orbit, blood vessels & lymph vessels of orbit.

7. The Eye	7. Movements of eye ball, Extrinsic & intrinsic muscles, their nerve supply, fascial sheaths of eye ball, structure of eye ball & contents of eye ball.
8. The Ear	8. Structure of external, middle & internal ear, muscles of middle ear their nerve supply & actions, auditory ossicles, auditory tube & mastoid antrum.
9. The mandible	9. Bony features, muscular attachments, foramina & structures passing through them.
10. Temporomandibular joint.	10. Articulation, type, capsule, ligaments, movements & muscles producing these movements & nerve supply.
11. The Scalp	11. Structure, muscles, nerve supply, blood supply & lymphatic drainage.
12. The Face	12. The skin, cutaneous supply, blood supply & lymphatic drainage. Muscles of facial expression, their nerve supply & actions.
B. 13. The Neck	13. Bones of neck, muscles, relations, deep cervical fascia.
14. Muscular triangles of neck.	14. Boundaries & contents
15. Vessels of head & neck	15. Name, location, course, relations & branches.
16. Lymph drainage of head & neck.	16. Groups of regional lymph nodes & their draining areas.
17. Cranial Nerves	17. Name, components, functions, opening in skull, course, relations & branches.
18. Cervical plexus	18. Organization & branches.
19. The autonomic nervous system	19. Cervical part of sympathetic trunk its location, ganglia, relations & branches. Parasympathetic ganglia their location & branches.
20. The Digestive system in head & neck	20. The mouth, palate, tongue, salivary glands, pharynx & esophagus.
21. The Respiratory system in head & neck.	21. The nose, paranasal sinuses, larynx, trachea.
22. Endocrine glands in head & neck	22. Pituitary, pineal, thyroid & parathyroid glands their location, relations, blood supply & functions.
23. The root of neck	23. Muscles & vessels.
24. The Thoracic duct	24. Location & relations

25. Radiographic Anatomy.	25. Study the poster anterior & lateral radiographs of skull.
26. Surface Anatomy	26. Identify the anatomical landmarks of head & neck region.

IX. TEACHING HOURS:

Theory Hours

100 hours

Practical Hours

300 hours

Total Hours of Teaching

100+300 = 400 hours