MODULE 3

CRANIOFACIAL MODULE

1st Year BDS

Contents

Vision & Mission

Khyber Medical University (KMU) Vision:

Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Medical University (KMU) Mission:

Khyber Medical University aims to promote professional competence through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Health Professions Education & Research (IHPER) Mission:

To produce leaders, innovators and researchers in health professions education who can apply global knowledge to resolve local issues.

Teaching Hours Allocation

S. No	Subject	Hours
1.	Anatomy	89
2.	Oral Biology & Tooth Morphology	56
3.	Physiology	64
4.	Biochemistry	11
5.	Oral Medicine	1
Total		**221**

Themes

S. No	Theme	Duration in Weeks
1.	Orofacial Pain	1
2.	Head injury	2
3.	Neck Stiffness	1
4.	Facial Paralysis	0.5
5.	Sore Mouth	0.5
6.	Dental Caries	1
7.	Swollen Eye	1
8.	Nosebleed	1
Total		**8 weeks**

Learning Objectives

By the end of this Module, 1st year BDS students will be able to:

1. Describe the histology, structure, biochemical properties, function, and pathologies of bones and muscles in the cranium and face.
2. Describe the histology, anatomical structures, biochemical properties, and functions of the cranium.
3. Describe the development and anatomical structures of the face.
4. Discuss the overview of Trigeminal Neuralgia and Bell's Palsy.
5. Discuss the structure and features of maxillary central and lateral incisors, maxillary pre-molars, and maxillary canines.
6. Discuss the structure and features of mandibular central and lateral incisors and mandibular canines.
7. Describe the development, histology, functions, and different structures of the oral cavity.
8. Discuss an overview of common dental diseases such as caries, plaque, and calculus.
9. Describe the development, histology, structure, and function of the orbit and eye.
10. Describe the development, histology, structure, and function of the nose and paranasal sinuses.

Theme 1: Orofacial pain			
Subject	**Subject**	**Subject**	**Subject**
Oral Biology & Tooth Morphology	Alveolar Bone	3hrs	1. Describe structure of alveolar bone with its functions. 2. Discuss types and formation of alveolar bone. 3. Discuss age related changes of bone.
	Mandibular Central & Lateral Incisors	4hrs	4. Explain the morphology of labial, lingual, mesial, distal, and incisal, aspects of crown of mandibular central and lateral incisors. 5. Explain morphology of root of both incisors. 6. Explain variations and anomalies associated with mandibular central and lateral incisors. 7. Explain variations and anomalies associated with mandibular central and lateral incisors. 8. Differentiate between maxillary and mandibular incisors
Anatomy	Parathyroid Gland	1hr	9. Describe gross and histological features of parathyroid gland. 10. Describe blood supply of Parathyroid gland. 11. Describe nerve supply of Parathyroid gland.
	Trigeminal Nerve and Ganglion	2hrs	12. Explain the origin, course, and enumerate the main divisions of the trigeminal nerve. 13. Describe location and relations of Trigeminal Ganglion (TG). 14. Enumerate roots and branches of TG. 15. Describe blood supply of TG. 16. Define trigeminal neuralgia.

Physiology	Bone Metabolism: 1. Calcium and phosphate 2. Remodelling of bone 3. Vitamin D 4. Parathyroid hormone	4hrs	17. Describe the overview of Calcium and Phosphate regulation in ECF and plasma. 18. Describe the role of Vitamin D in the absorption of calcium and phosphate by the intestines. 19. Describe bone and its relationship to extracellular calcium and phosphate 20. Describe the mechanism of bone calcification. 21. Discuss remodeling of bone and functions of bone cells (osteoblasts and osteoclasts). 22. Discuss the formation and actions of Vitamin D. 23. Explain the effects of parathyroid hormone on calcium and phosphate in ECF. 24. Describe the control of parathyroid hormone secretion by calcium ion concentration. 25. Discuss pathophysiology of parathyroid hormone and bone diseases: Hypoparathyroidism & Hyperparathyroidism.
	Growth hormone	1hr	26. Discuss the physiological functions of growth hormone. 27. Describe the regulation of growth hormone secretion. 28. Enlist the factors that stimulate or inhibit the secretion of growth hormone secretion. 29. Discuss the abnormalities of growth hormone secretion.
	Skeletal Muscle physiology	2hrs	30. Discuss the physiological anatomy of skeletal muscle. 31. Explain the general and molecular mechanism of muscle contraction. 32. Describe the “Walk-along” theory of contraction. 33. Differentiate between isometric verses isotonic muscle contraction.
	Neuromuscular junction	1hr	34. Draw and label neuromuscular junction – the motor end plate. 35. Discuss the secretion and regulation of acetylcholine at neuromuscular junction. 36. Discuss muscle action potential. 37. Explain the mechanism of excitation-contraction coupling in the muscles.

Biochemistry	Vitamins	2hrs	38. Define vitamins. 39. Describe different types of vitamins. 40. Discuss sources of vitamins. 41. Enlist functions of vitamins. 45. Identify deficiency diseases of each vitamin.
	Role of Vitamin D In Bone Metabolism	1hr	46. Discuss the role of vitamin D. 47. Describe the effect of vitamin D in calcium absorption and in bone mineralization. 48. Discuss the impact of vitamin D deficiency on bones.
	Role of GAGS	1hr	49. Discuss GAGS. 50. Enlist the functions of GAGS. 51. Discuss the role of GAGS in formation of connective tissues, cartilage, bones, and tendons.
	Role of vitamin B1, sodium and potassium	1hr	52. Discuss the role of B1 as TPP in transmission of nerve impulse and acetylcholine synthesis. 53. Discuss the role of sodium and potassium in the transmission of nerve impulse.
	Prostaglandins	1hr	54. Discuss prostaglandins. 55. Discuss synthesis and functions of prostaglandins and pain management.
Lab Work			
Oral Biology & Tooth Morphology	Mandibular Central & Lateral Incisors	6hrs	56. Identify on tooth models/specimens or images labial depressions, imbrication lines, height of contour, cingulum, lingual fossa, marginal ridges, incisal edge. 57. Draw and label mandibular central and lateral incisors.

Anatomy	Parathyroid Gland	2hrs	58. Identify the histological features of Parathyroid gland.

Theme 2: Head Injury			
Embryology	Cranium	1hr	58. Describe the development of skull.
Gross Anatomy	Norma Frontalis (5th)	2hrs	59. Identify the skeletal features of norma frontalis (including Zygoma, Maxilla, and Mandible). 60. Describe muscle attachments. 61. Enlist structures passing through foramina. 62. Enumerate relevant clinical problems of Norma frontalis.
	Norma Basalis (3rd)	3hrs	63. Discuss the anterior cranial fossa, middle and posterior cranial fossa. 64. Describe muscle attachments. 65. Enlist structures passing through foramina.
	Norma Lateralis (4th)	3hrs	66. Identify the skeletal features of Norma lateralis. 67. Describe muscle attachments. 68. Enlist structures passing through foramina. 69. Enumerate relevant clinical problems of norma lateralis. 70. Discuss temporal fossa, infra-temporal fossa, and pterygopalatine fossa.
	Norma Occipitalis (2nd)	1hr	71. Identify the skeletal features of norma occipitalis. 72. Describe muscle attachments. 73. Describe emissary veins of skull.
	Norma Verticalis (1st sequence)	1hr	74. Identify the skeletal features of norma verticalis. 75. Enumerate relevant clinical problems of norma verticalis.

Neuroanatomy	Neuron	1hr	76. Define neuron. 77. Enumerate the supporting cells of nervous tissue. 78. Describe the structure of multi-polar neuron. 79. Classify neurons on the basis of morphology, function, and length.
	Meninges	1hr	80. Explain structural features of meninges. 81. Describe blood supply of meninges. 82. Describe nerve supply of meninges. 83. Enumerate relevant clinical problems of structures of cranial cavity (e.g., headache, extradural and subdural hemorrhage etc.). 84. Enlist paired and unpaired venous sinuses of dura matter.
	Dural Venous Sinuses	1hr	85. Enlist paired and unpaired venous sinuses of dura matter 86. Identify various folds of the dura mater on a model 87. Describe relations, tributaries, and drainage of venous sinuses 88. Enumerate relevant clinical problems of venous sinuses (e.g., thrombosis of cavernous sinus, sigmoid and super sagittal sinus pulsating exophthalmos etc.). 89. Relate connection of emissary veins with sinuses.
	Hypophysis Cerebri	1hr	90. Describe relations of hypophysis cerebri. 91. Describe parts of hypophysis cerebri. 92. Describe blood supply of hypophysis cerebri. 93. Briefly explain hypothalamus-hypophyseal portal system.
	Cranial Nerves	1hr	94. Enlist cranial nerves. 95. Classify cranial nerves according to their functions.

	Middle Meningeal Artery	1hr	96. Explain course and relations of middle meningeal artery. 97. Enlist branches of middle meningeal artery. 98. Discuss clinical relevance of extradural hemorrhage with middle meningeal artery.

	Cerebrum Cerebral Cortex	2hrs	99. Identify all the lobes of the brain. 100. Explain the detail of the cerebral hemisphere including internal structures. 101. Identify the location of the cortical areas. 102. Explain the functions of all the important cortical areas.
	Cerebellum	2hrs	103. Describe the gross anatomy of the cerebellum. 104. Describe the blood supply of the cerebellum. 105. Discuss the connections and functions of cerebellum.
	Thalamus	1hr	106. Enumerate all the important nuclei of the thalamus and their functions. 107. Identify gross structures of the thalamus. 108. Discuss the connections of thalamus.
	Basal Nuclei (Ganglia)	1hr	109. Enumerate the basal nuclei and its most important structures. 110. Recall the important functions of the basal nuclei along with their clinical correlations.
	Hypothalamus	1hr	111. Enumerate the nuclei and their functions of the hypothalamus. 112. Discuss the connections of hypothalamus.
	Limbic System	1hr	113. Describe components of limbic system.
	Circle of Willis	1hr	114. Describe structure of circle of Willis. 115. Describe supply by circle of Willis to various structures.

	Ventricular System of the Brain	2hrs	116. Describe anatomy of Ventricular system of the brain. 117. Describe pathway of ventricular system.

	Brain Stem	4hrs	118. Identify gross structures of the Medulla oblongata, Pons, and mid-brain on a model. 119. Draw and label the cross sections of Medulla Oblongata, Pons, and mid-brain at various levels. 120. Enlist the clinical problems associated with Medulla Oblongata Pons, and mid-brain.
Physiology	Pituitary hormones	2hrs	121. Discuss the pituitary gland and its two lobes: anterior & posterior. 122. Enlist the physiological functions of pituitary gland hormones. 123. Describe the relation of pituitary to hypothalamus. 124. Enlist the physiological functions of hypothalamic hormones that control the secretions of anterior pituitary gland. 125. Summarize the hypothalamic-hypophysial portal blood vessels of the anterior pituitary gland and its significance.
	Cerebral Cortex	4hrs	126. Discuss the physiological anatomy of cerebral cortex. 127. Describe the functions of specific cortical areas: 128. Primary motor area – supplementary and premotor areas. 129. Somatosensory area – secondary sensory area. 130. Describe the function of association areas of cerebral cortex. a. Parieto-occipitotemporal association area. b. Prefrontal association area. c. Limbic association area. 131. Explain the role of Broca area in the formation of word and language. 132. Interpret the function of the posterior superior temporal lobe – Wernicke'e area.

			133. Discuss the function of angular gyrus in the interpretation of visual information. 134. Discuss the concept of the dominant hemisphere. 135. Enlist the Functions of the parieto-occipitotemporal cortex in the non-dominant hemisphere.
	Memory	2hrs	136. Describe memory and explain its mechanism of formation. 137. Discuss the role of synaptic facilitation or inhibition in the formation of positive and negative memory. 138. Classify the types of memory: short term memory, intermediate long-term memory, long term memory. 139. Classify memory on the basis of type of information stored: declarative memory, skill memory. 140. Explain consolidation of memory. 141. Discuss the Retrograde Amnesia.
	Limbic System & Hypothalamus	2hrs	142. Explain the functions of limbic system. 143. Illustrate the anatomic structures of limbic system, showing key position of hypothalamus. 144. Discuss the hypothalamus as a major control headquarter for limbic system. 145. Explain the vegetative and behavioral functions of limbic system. 146. Enlist specific functions of other parts of limbic system: a) Hippocampus b) Amygdala c) Limbic cortex
	Basal ganglia	2hrs	147. Draw and label basal ganglia nuclei. 148. Discuss neuronal circuitry of basal ganglia and its anatomical relations to

			other structures of the brain. 149. Classify and explain the specific functions of circuits of basal ganglia nuclei: a) Putamen circuit b) Caudate circuit 150. Enlist the specific neurotransmitters in the basal ganglia system: Dopamine, GABA. 151. Introduce the clinical relevance of basal ganglia: Parkinson's disease.
	Cerebral blood flow (CSF)	1hr	152. Discuss the regulation of CSF in detail. 153. Explain the formation, flow and absorption of CSF. 154. Discuss the cushioning function of the cerebrospinal fluid. 155. Explain the cerebrospinal fluid pressure. 156. Discuss blood-brain barrier and blood-CSF. 157. Define brain edema and its causes.
	States of brain activity	1hr	158. Define sleep and describe its two types. 159. Describe the neuronal centers, neurohormonal substances and mechanism of sleep. 160. Describe the physiological effects of sleep. 161. Discuss brain waves of EEG and its types.
	Brainstem	2hrs	162. Enlist the role of brainstem in controlling motor functions. 163. Discuss the role of reticular and vestibular nuclei in the support of body against gravity. 164. Explain the vestibular sensations and maintenance of equilibrium.
	Cerebellum	2hrs	165. Describe the anatomical functional areas of cerebellum 166. Describe with the help of diagrams the input pathways to cerebellum: afferent pathways.

			167. Describe with the help of diagrams the output pathways from cerebellum: efferent pathways. 168. Explain the function of cerebellum in motor control: a) Vestibulocerebellum b) Spinocerebellum c) Cerebrocerebellum 169. Discuss clinical abnormalities of cerebellum: ataxia, past pointing, dysarthria

Biochemistry	Synthesis of Neuro Transmitters	2hrs	175. Define the characteristics of neurotransmitters. 176. Enlist neurotransmitters involved in central nervous tissues. 177. Explain the role of amino acid (tyrosine, glutamate, and tryptophan) in biosynthesis of neurotransmitters. 178. Discuss the role of vitamin B6 (pyridoxine) in decarboxylation of certain amines to produce neurotransmitters.

Lab Work			
Anatomy	Norma Basalis (3rd)	2hrs	179. Demonstrate surface markings of different structures on skull model. 180. Identify the structures present in: • Anterior Cranial fossa. • Middle Cranial fossa. • Posterior Cranial fossa.
	Norma Lateralis (4^{th})	2hrs	181. Demonstrate surface markings of different structures in skull model.
	Norma Occipitalis (2^{nd})	2hrs	182. Demonstrate surface markings of different structures in skull model.
	Norma Verticalis (1^{st})	2hrs	183. Demonstrate surface markings of different structures in skull model.
Neuroanatomy	Meninges	2hrs	184. Identify various folds of the dura mater on a model.

	Cranial Nerves	2hrs	185. Identify the site of origin of cranial nerves.
	Brain	2hrs	186. Identify the different parts of the brain on model.
Physiology	Examination of cerebellum	2hrs	187. Examine and interpret the results of various cerebellar tests such as the finger-to-nose test, rapid alternating movements, and heel-to-shin test, identifying normal versus abnormal findings.
Theme 3: Neck Stiffness			
Histology	Spinal cord	1hr	188. Describe histological features of spinal cord. 189. Discuss transverse section of spinal cord at different levels.
Neuroanatomy	Vertebral Canal	1hr	190. Describe contents of vertebral canal.
	Accessory Nerve	1hr	191. Explain the origin, course, branches of the divisions of the accessory nerve.
	Spinal Cord	1hr	192. Explain the gross anatomy of the spinal cord. 193. Enumerate clinical problems of spinal cord.
	Ascending and Descending Tracts	2hrs	194. Enumerate the ascending and descending tracts of the spinal cord with functions. 195. Discuss spinothalamic tract. 196. Discuss corticospinal tract.
Physiology	Sensory receptors and somatic sensations	1hr	197. Classify and describe the sensory receptors 198. Describe the adaptation of receptors 199. Classify nerve fibers 200. Classify somatic sensations 201. Describe detection and transmission of tactile sensations
Physiology	Spinal Cord Sensory functions	2hrs	202. Enumerate the classification of sensory pathways 203. Describe dorsal column medial lemniscal system and enumerate its characteristics 204. Discuss the sensations transmitted through antero-lateral system pathway

	Spinal Cord Motor functions (Spinal Reflexes)	3hrs	205. Describe the structural organization of spinal cord 206. Define reflex action and enlist components of reflex arc 207. Explain the role of proprioceptors (muscle spindles and Golgi tendon organs) in motor movements. 208. Explain muscle stretch reflex and golgi tendon reflex 209. Describe the mechanism of flexor reflex and withdrawal reflex 210. Describe the mechanism of crossed extensor reflex 211. Identify the reflexes of posture and locomotion in the spinal cord. 212. Differentiate between signs of the upper and lower motor neurons
Lab Work			
Neuroanatomy	Spinal Cord	2hrs	213. Identify and describe microscopic anatomy of spinal cord. 214. Draw and label the cross sections of spinal cord at different levels.
Physiology	Spinal Cord Reflexes	2hrs	215. Demonstrate the correct technique for eliciting spinal reflexes, such as the knee-jerk (patellar), ankle-jerk (Achilles), biceps, triceps, and plantar reflexes, using a reflex hammer. 216. Apply the principles of reflex arc physiology to interpret the results of different spinal reflexes.
Theme 4: Facial Paralysis			
Anatomy	Pharyngeal Arches, Pouches, and Clefts	2hrs	187. Describe derivatives of pharyngeal arches. 188. Describe derivatives of pharyngeal pouches. 189. Describe derivatives of pharyngeal clefts. 190. Describe anomalies of pharyngeal apparatus.
	Development of Face	1hrs	191. Discuss role of molecular regulation in face development.
Oral Biology & Tooth Morphology	Development of Maxilla and Mandible	2hrs	192. Describe the development of mandible. 193. Describe the development of maxilla.
Gross Anatomy	Face	2hrs	194. Describe features of skin and superficial fascia. 195. Tabulate facial muscles, their origin, insertion, actions. 196. Classify functional groups of facial muscles.

			197. Describe nerve supply of face. 198. Describe blood supply of face. 199. Describe lymphatic drainage of face. 200. Enumerate relevant clinical problems of structures of face. 201. Demonstrate how different facial muscles help in facial expressions.
Neuroanatomy	Facial Nerve	2hrs	202. Explain the origin and course (intracranial, extra-cranial) of facial nerve. 203. Enumerate the main divisions of the facial nerve. 204. Explain the distribution of its branches along with the functions. 205. Enumerate the clinical conditions associated with facial nerve.
Oral Medicine	Bell's Palsy	1hr	206. Describe the pathophysiology of bell's palsy. 207. Enlist the etiology of bell's palsy. 208. Enumerate clinical features of bell's palsy. 209. Discuss the preventive aspects of bell's palsy.
	Somatosensory cortex	1hr	210. Describe the distinct areas of somatosensory cortex. 211. Discuss the spatial orientation od signals from different parts of the body in somatosensory area. 212. Describe the functions of somatosensory area I and somatosensory association area.
	Pain and thermal sensations	2hrs	213. Describe the types of pain: fast pain, slow pain. 214. Discuss the dual pathways for transmission of pain signals to CNS. 215. Differentiate between fast and slow pain. 216. Describe pain suppression system in brain and spinal cord. 217. Describe referred and visceral pain. 218. Classify and describe the headache a) Intracranial headache b) Extracranial headache 219. Describe thermal receptors and their mechanism of stimulation.

	Motor cortex	2hrs	220. Discuss the types and functions of motor cortex a) Primary motor cortex b) Premotor cortex c) Supplementary motor cortex 221. Define motor homunculus. 222. Discuss transmission of signals from motor cortex to muscles (descending tracts). a) Corticospinal tract (pyramidal) b) Extrapyramidal tracts
Lab Work			
Physiology	Cranial nerve 7th (Facial) examination	2hrs	223. Examine subject's facial nerve.
Gross Anatomy	Face	2hrs	224. Identify different facial muscles on model.
Theme 5: Sore Mouth			
Oral Biology & Tooth Morphology	Tongue	1hr	225. Explain development of tongue. 226. Explain development of taste buds.
	Palate	1hr	227. Explain development of primary and secondary palate. 228. Discuss common anomalies related to the development of palate.
	Oral Cavity	2hrs	216. Describe structures of oral cavity.
			217. Describe blood supply of teeth and gums. 218. Describe lymphatic drainage of oral cavity. 219. Describe nerve supply of teeth and gums.

	Hard And Soft Palate	1hr	220. Describe structure of hard and soft palate. 221. Describe muscles of the soft palate, their origin and insertion, actions. 222. Describe nerve supply of hard and soft palate. 223. Explain lymphatic drainage of hard and soft palate
	Oral Mucosa	4 hrs	224. Elaborate cells of OMM that is Keratinocytes and Non-keratinocytes, Melanocytes Langerhans cells & Merkel cells. 225. Identify histological features, location, and function of tongue papillae & taste buds, 226. Correlate Gingival sulcus, dento-gingival junction mucocutaneous junction. 227. Explain development of OMM, age changes, blood supply &nerve supply of oral mucosa. 228. Discuss the clinical significance of oral mucosa.
Anatomy	Gross Anatomy of Tongue	2hrs	226. Describe external features of tongue. 227. Describe muscles of tongue, their origin and insertion, actions. 228. Explain blood supply of tongue. 229. Describe lymphatic drainage of tongue. 230. Enumerate the nerve supply of tongue. 231. Enumerate relevant clinical problems tongue (glossitis, lingual tonsil, carcinoma etc.).
Neuroanatomy	Hypoglossal Nerve Glossopharyngeal Nerve	1hr	232. Explain the origin, course, and branches of hypoglossal nerve. 233. Describe the clinical significance of hypoglossal nerve. 234. Explain the origin, course, branches of the divisions of the glossopharyngeal nerve.

Physiology	Sense of taste	1hr	235. Discuss primary sensations of taste and threshold for taste. 236. Describe the taste bud and its function. 237. Describe mechanism of stimulation of taste buds. 238. Describe transmission of taste signals into the central nervous system.

Lab Work			
Oral Biology & Tooth Morphology	Hard And Soft Palate	2hrs	239. Demonstrate surface marking of different structures of hard and soft palate on model.
Histology	Tongue	2hrs	240. Identify the histological features of tongue and taste buds.
	Lip	2hrs	241. Identify the histological features of lip.
Physiology	Cranial nerves examination: trigeminal, facial	2hrs	242. Examine subject's trigeminal and facial nerve.
	Cranial nerves examination: Hypoglossal, vagus, glossopharyngeal, accessory	2hrs	243. Examine subject's hypoglossal nerve. 244. Examine subject's accessory nerve

Theme 6: Dental Caries

	Dentine	10 hrs	245. Describe physical and chemical properties of dentin. 246. Explain microscopic structures of dentin covering dentinal tubules, peritubular dentin, intertubular dentin, pre-dentin. 247. Describe of odontoblast with diagrammatic representation in detail. 248. Types of dentin including primary secondary and tertiary dentin. 249. Differentiation of incremental lines, interglobular dentin, granular layer. 250. Interpret different types of incremental lines seen in dentin. 251. Describe the age changes related to dentin. 252. Review development of dentin with complete comprehension of dentinogenesis. 253. Compare the process of amelogenesis and dentinogenesis. 254. Enlist the genes effecting dentinogenesis. 255. Explain hypersensitivity of dentin and its mechanism. 256. Discuss the theories of pain transmission and hydrodynamic.

	Cementum	6hrs	257. Discuss introduction to cementum with explanation of its physical and chemical properties. 258. Enlist growth factors which control cementogenesis. 259. Define cementogenesis with complete description of cement oblast structure and its origin. 260. Describe types of cementum and tabulate differences of various types including cellular and a cellular cementum. 261. Discuss cement dentinal and cement enamel junction and explain its types. 262. Draw diagram of cement enamel junctions. 263. Enumerate functions of cementum with short description. 264. Correlate cementum pathologies clinically. 265. Explain hypercementosis associated with difficult extraction.
Oral Biology & Tooth Morphology	Maxillary & Mandibular Canines	2hrs	266. Discuss initiation of calcification, crown completion age, age of eruption and root completion age. arch position, general outline. 267. Describe various aspects (labial, lingual, mesial, distal, and incisal) of crowns of maxillary and mandibular canines. 268. Discuss number, shape, and inclination of root. 269. Discuss number, location and significance of pulp horns, chamber, and canal. 273. Differentiate between maxillary and mandibular canines.
Biochemistry	Role of Calcium, Phosphorus in Teeth	1hr	274. Discuss the role of Calcium and Phosphorus in formation of cellular matrix and bone.

			275. Explain the role of Calcium and Phosphorus in the development of bones and teeth.
	Magnesium	1hr	281. Discuss the role of Magnesium in formation of cellular matrix and bone.
Physiology	Calcitonin	1hr	282. Discuss calcium and phosphate regulation in the body. 283. Discuss relationship of bone with extracellular calcium and phosphate. 284. Discuss the role of calcitonin in the regulation of calcium concentration.
Lab Work			
Oral Biology & Tooth Morphology	Maxillary & Mandibular Canines	4hrs	285. Identify labial depressions, imbrication lines, height of contour, cingulum, lingual fossa, marginal ridges, incisal slop on tooth models/specimens or images. 286. Draw and label different aspects of maxillary and mandibular canines.
Theme 7: Swollen Eye			
Gross Anatomy	Bony Orbit	1hr	287. Describe walls and openings in the orbital cavity. 288. Enumerate foramen and fissures in bony orbit and structures passing through it.
	Extraocular Muscles	1hr	289. Explain origin, insertion, nerve supply and action of extraocular muscles.

	Eye Ball	3hrs	290. Describe features & relevant clinical anatomy of: • Outer Coat • Cornea • Middle Coat • Inner Coat • Aqueous Humour • Vitreous Body
	Lacrimal Gland and Ciliary Gland	1hr	291. Discuss lacrimal and ciliary glands.
	Ophthalmic Artery Ophthalmic Vein	3hrs	292. Explain origin, course, and relations of ophthalmic artery. 293. Describe branches of ophthalmic artery. 294. Describe parts of ophthalmic vein. 295. Describe supply of ophthalmic vein. 296. Discuss clinical significance associated with the vessels.
Neuroanatomy	Cranial Nerves II, III, IV, VI	2hrs	297. Explain the Origin, course, branches, and functions of: • Optic Nerve • Oculomotor Nerve • Trochlear nerve • Abducent nerve 298. Discuss clinical significance associated with the nerves.
	Cavernous Sinus	1hr	299. Explain the important relations of the cavernous sinus. 300. Enumerate the contents of the cavernous sinus.
Physiology	Photochemistry of vision	2hrs	301. Describe the physiological anatomy of eye. 302. Describe function of structural elements of retina.

			303. Discuss rhodopsin-retinal visual cycle. 304. Describe the photochemistry of color vision by cones. 305. Discuss light and dark adaptation of retina.
	Optics of eye	2hrs	306. Discuss the mechanism of accommodation of eye. 307. Describe the errors of refraction. 308. Explain the visual acquity of the eye.

	Intraocular fluid	1hr	309. Describe the formation of aqueous humor by ciliary body. 310. Describe the regulation of intraocular pressure. 311. Enumerate the pathophysiology of glaucoma.
	Visual pathways	1hr	312. Discuss the visual pathway from retinal cells to visual cortex. 313. Enumerate the specific functions of all five types of retinal cells. 314. Enumerate the neurotransmitters released by retinal neurons.
	Reflexes of eye	2hrs	315. Explain the mechanism of Accommodation reflex. 316. Explain the mechanism of Pupillary light reflex.
Biochemistry	Vitamin A	1hr	317. Discuss the role of vitamin A.

Oral Biology & Tooth Morphology	Maxillary 1st and 2nd Pre-molars	3hrs	318. Discuss initiation of calcification, age of crown completion, age of eruption, and root completion. 319. Discuss arch position and general outlines. 320. Describe various aspects (labial, lingual, mesial, distal, and occlusal aspect) of crowns of maxillary pre-molars. 321. Describe number, location and significance of pulp horns, chamber, and canals. 322. Describe number, shape, and inclination of roots. 323. Differentiate between maxillary 1st and 2nd premolar.
Anatomy	Eye	2hrs	324. Demonstrate anatomical features of eye on a model.
Lab Work			
Oral Biology & Tooth Morphology	Maxillary 1st and 2nd Pre-molars	4hrs	325. Identify crown outline, buccal, lingual, mesial, distal surfaces, occlusal table and its components on tooth models/specimens or images. 326. Draw and label different aspects of maxillary first and second pre-molar.
Physiology	Cranial nerves examination: cculomotor, abducent, trochlear	2hrs	327. Examine subject's 3rd, 4th and 6th cranial nerve.
	Optic nerve examination: Visual aquity, Color vision, ~~Perimetry~~	2hrs	328. Examine subject's 2nd cranial nerve.

Theme 8: Nosebleed			
Gross Anatomy	Nose	1hr	329. Describe features of nose. 330. Describe blood supply of nose. 331. Describe nerve supply of nose. 332. Describe lymphatic drainage of nose. 333. Enumerate relevant clinical problems of nose (e.g., rhinitis, fracture of cribriform plate, epistaxis etc.).
	Lateral and Medial Wall of Nose	1hr	334. Discuss features of lateral wall of nose. 335. Discuss features of conchae and meatuses.
	Paranasal Sinuses	1hr	336. Discuss features of paranasal sinuses (frontal, maxillary, sphenoidal, ethmoidal). 337. Explain relations of sinuses. 338. Describe blood supply of sinuses. 339. Describe nerve supply of sinuses. 340. Describe lymphatic drainage of sinuses. 341. Enumerate relevant clinical problems related to sinuses (e.g., carcinoma of maxillary sinus, sinusitis etc).
	Pterygopalatine Ganglion	1hr	342. Describe features of pterygopalatine ganglion. 343. Explain connections of Pterygopalatine ganglion.
			344. Describe branches of Pterygopalatine ganglion. 345. Enumerate relevant clinical problems related to Pterygopalatine ganglion.

Neuroanatomy	Olfactory Nerve	1hr	346. Explain the origin, course, and function of the olfactory nerve. 347. Describe the clinical aspects associated with Olfactory nerve.
Oral Biology & Tooth Morphology	Maxillary Sinus	2hrs	348. Enumerate the para nasal sinuses. 349. Describe the anatomical structures & boundaries of maxillary sinus. 350. Discuss the development and functions of maxillary sinus. 351. Describe the microscopic features such as mucus membrane and epithelium of maxillary sinus to differentiate between oral mucosa & respiratory mucosa.
Physiology	Sense of smell	1hr	352. Describe olfactory membrane. 353. Explain mechanism of excitation of the olfactory cells. 354. Discuss Rapid Adaptation of Olfactory Sensations. 355. Describe transmission of smell signals into the central nervous system.
Lab Work			
Gross Anatomy	Lateral Wall of Nose	2hrs	356. Demonstrate anatomical features of conchae and meatuses on model.
Physiology	Olfactory nerve examination	2hrs	357. Examine the subject's olfactory nerve.

Learning Resources

S#	Subjects	Resources
1.	Anatomy	**A. GROSS ANATOMY** 1. Last's Anatomy **B. EMBRYOLOGY** 1. Langman's Medical Embryology **C. HISTOLOGY** 1. Medical Histology By Laiq Hussain **Reference Books** 1. Netter Atlas of Human Anatomy 2. Gray's Anatomy
2	Biochemistry	**Text Books** 1. Lippincott illustrated reviews 8th 2. Harper's illustrated Biochemistry 30th 3. U. Satyanarayan and U. Chakarpani 4th **Reference Books** 1. Lippincott illustrated reviews 2. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry 3. U. Satyanarayana Biochemistry 4. U. satyanarayan and U. Chakarpani 4th edition 5. Harper's illustrated Biochemistry 6. Rodwell VW, Bender DA ,Botham KM., Kennelly PJ, Weil P. Eds. Victor W. Rodwell et al. 7. Fundamentals of Biochemistry 8. Donald V., Judith G. Voet, Charlotte W. John wiley and sons, New york 9. Netter's essential Biochemisty 10. Lippincott illustrated reviews 11. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry

3	Physiology	**Textbooks** 1. Guyton and Hall Textbook of Medical Physiology, 13th Edition by John E. Hall. 2. Human Physiology: From Cells to Systems, 8th Edition by Lauralee Sherwood
4	Oral Biology	**Textbook** 1. Ten Cate's Oral Histology 2. Orban's Oral Histology and Embryology **3.** Concise Dental Anatomy and Morphology by James L. Fuller **Reference Books** 1. Oral Anatomy, Histology and Embryology by B.K.B Berkovitz