**Learning objectives**

**Neurosciences-1A Module**

**Year-2 (MBBS)**

**Total Weeks-6**

Central Curriculum Committee, Khyber Medical University

**Themes**

1. Numbness and tingling---1 week
2. Paraplegia-------------------1 week
3. Syncope--------------------1 week
4. Hemiplegia / Aphasia------------------1 week
5. Tremors ---------------------1 week
6. Headache ---------------1 week

**General learning outcomes**

At the end of this module, the 2nd year MBBS students will be able to:

1. Explain the gross and microscopic structural and functional features of peripheral nerves, spinal cord and brain.
2. Describe the development of forebrain, midbrain and hindbrain
3. Describe the basic functions of synapses, neurotransmitters and mechanisms of electrical events during neuronal excitation
4. Explain the structure and functions of different receptors during neuronal excitation
5. Describe the mechanisms and pathways of sensory inputs in the nervous system
6. Explain the organization, structure, functions, and neurotransmitters of autonomic nervous system
7. Describe the blood supply and venous drainage of brain and spinal cord
8. Describe the organization, structure and functions of motor system of the brain and spinal cord
9. Explain the organization, structure and functions of cerebellum and basal ganglia
10. Explain the structure, formation and drainage of cerebrospinal fluid in the brain and spinal cord
11. Describe the functions of limbic system and reticular activating system
12. Describe the pathophysiology and prevention of common diseases like stroke, epilepsy, hydrocephalus and brain injuries
13. Identify the microscopic structure of spinal cord, cerebral and cerebellar cortex
14. Examine nervous system of a standardized patient (sensations, motor functions, and higher cortical functions and tendon reflexes)

Specific Learning objectives

**Theme-1 (numbness and tingling)**

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| Subject | Topic | S. No | Learning objectives |
| Gross anatomy | Overview of nervous system | 1 | Describe the general features of neurons and its classification |
|  |  | 2 | Differentiate between central and peripheral nervous system. |
|  |  | 3 | Describe the general features of brain (forebrain, midbrain and hindbrain) |
|  |  | 4 | Describe the general features of spinal cord including its enlargements at different levels |
|  |  | 5 | Describe the general features of cranial and spinal nerves |
|  |  | 6 | Differentiate between the anatomical aspects of sympathetic and parasympathetic system |
| Embryology | Forebrain, midbrain and hindbrain | 7 | Describe the development of primary and secondary brain vesicles |
|  |  | 8 | Enlist the derivatives of the brain vesicles |
|  |  | 9 | Describe the development of prosencephalon, mesencepahalon and rhombencephalon |
|  |  | 10 | Discuss congenital anomalies associated with each region of brain |
| Physiology | Organization of the Nervous System | 11 | Describe general design of the nervous system |
|  |  | 12 | Describe various divisions of the nervous system. |
|  |  | 13 | Describe structural and functional unit of CNS. |
|  |  | 14 | Describe Functional components of Neuron. |
|  |  | 15 | Describe Functional and Structural classification of Neurons |
|  |  | 16 | Describe major levels of central  nervous system function |
|  |  | 17 | Describe Glial cells and their functions. |
|  |  | 18 | Compare nervous system to a computer |
|  | Basic Functions of Synapses | 19 | Define and classify synapses |
|  |  | 20 | Explain physiological structure of synapse |
|  |  | 21 | Describe Mechanism by Which an Action Potential Causes Transmitter Release from the Presynaptic Terminals |
|  |  | 22 | Describe synaptic transmission and explain properties of synaptic transmission. |
|  |  | 23 | Describe mechanism of action of neurotransmitter on the post synaptic membrane. |
|  |  | 24 | Describe Second messenger system in the post synaptic neuron |
|  | Functions of Neurotransmitters | 25 | Define the characteristics of a neurotransmitter |
|  |  | 26 | Enumerate the neurotransmitters involved in central nervous system. |
|  |  | 27 | Classify neurotransmitters and describe the actions of some common neurotransmitters in central nervous system. |
|  | Electrical Events during Neuronal Excitation and Inhibition | 28 | Describe resting membrane potential of the neuronal soma. |
|  |  | 29 | Describe Effect of Synaptic Excitation on the Postsynaptic Membrane—Excitatory Postsynaptic Potential. |
|  |  | 30 | Describe Effect of Inhibitory Synapses on the Postsynaptic Membrane—Inhibitory Postsynaptic Potential. |
|  |  | 31 | Describe Generation of Action Potentials in the Initial Segment of the Axon Leaving the Neuron—Threshold for Excitation |
|  | Sensory Receptors | 32 | Define and classify receptors. |
|  |  | 33 | Classify receptors according to their location in the body. |
|  |  | 34 | Describe specific functions of receptors. |
|  |  | 35 | Describe Receptor or generation potential |
|  |  | 36 | Discuss mechanism of action of sensory transduction. |
|  | Coding of Sensory Information | 37 | Describe Doctrine of specific nerve energies |
|  |  | 38 | Describe Modality of Sensation—The “Labeled Line Principle” |
|  |  | 39 | Define and discuss law of projection |
|  |  | 40 | Discuss properties of stimulus; modality, Stimulus location Stimulus intensity Stimulus duration |
|  |  | 41 | Describe Frequency of action potentials with threshold level of receptor potential |
|  | Transmission and Processing of Signals in CNS | 42 | Describe Relaying of signals through  Neuronal pools; Divergence, Convergence, Prolongation of Signals |
|  | Types of nerve fibers, its regeneration and degeneration | 43 | Describe the mechanism of degeneration & regeneration. |
|  |  | 44 | Describe the duration required for regeneration inside & out of CNS. |
|  |  | 45 | Enumerate the causes of degeneration. |
|  |  | 46 | Discuss Wallerian degeneration |
|  |  | 47 | Identify the microscopic appearance of degenerating neurons |
|  | Somatic Sensations | 48 | Describe Tactile receptors in the skin and their functions: Pacinian corpuscles, Meissner’s corpuscles, Ruffini endings, Merkle cell, A-delta and C free nerve endings |
|  | Transmission in the Dorsal column–medial  Lemniscal system | 49 | Describe ascending pathways and enumerate the differences between the two. |
|  |  | 50 | Describe Transmission in the Dorsal column–medial Lemniscal system |
|  |  | 51 | Describe Spatial Orientation of the Nerve  Fibers in the Dorsal Column–Medial  Lemniscal System |
|  |  | 52 | Describe two-point discrimination |
|  | Somatosensory Cortex | 53 | Identify the diagrammatic representation of different areas of the body in the somatosensory cortex I |
|  |  | 54 | Identify Broadman’s areas of cerebral cortex and correlate each one of them with their respective functions. |
|  |  | 55 | Describe the functions of somatosensory area I. |
|  |  | 56 | Describe layers of the somatosensory cortex and their function. |
|  |  | 57 | Describe the functions of somatosensory association area |
|  | Transmission of  Sensory signals in the Anterolateral pathway | 58 | Differentiate the submodalities of nondiscriminative touch, temperature and nociception based on receptor transduction mechanism, localization within the spinal gray matter, and central termination of the pathways. |
|  |  | 59 | Describe functional organization at all levels and sub-modalities served by the anterolateral system and the equivalent components of the spinal trigeminal system. |
| Biochemistry | Neurotransmitters | 60 | Explain the biosynthesis of different neurotransmitters |
|  | Brain and nervous tissues metabolism | 61 | Describe the metabolism of brain and nervous tissues |
| General Medicine | Peripheral neuropathies | 62 | Describe the etiology and types of peripheral neuropathies |
|  |  | 63 | Discuss the clinical presentation and complications of diabetic neuropathies |
| Skills and affective domain | | | |
| Histology | Transverse section of spinal cord (cervical level) -1 | 64 | Identify the slide of transverse section of cervical spinal cord under the microscope |
| Physiology | Examination of sensations | 65 | Examine the sensations (tactile, position, pain, thermal, vibration) of lower limb on a standardized patient |

**Theme-2 (Paraplegia)**

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| Gross anatomy | Externals features of Spinal Cord | 66 | Describe the shape, grooves and sulci and extension of spinal cord |
|  |  | 67 | Enlist the segments of spinal cord |
|  |  | 68 | Differentiate between white and grey matter of spinal cord |
|  |  | 69 | Describe the meningeal covering of spinal cord |
|  |  | 70 | Describe the blood supply of spinal cord |
|  | Grey Matter of Spinal Cord | 71 | Describe the distribution of spinal cord into horns |
|  |  | 72 | Differentiate between anterior, lateral and posterior horns |
|  |  | 73 | Describe the distribution of sensory and motor neuron within the grey matter |
|  |  | 74 | Explain formation of Rexed lamina of spinal cord |
|  | White matter of spinal cord | 75 | Enumerate the ascending tracts |
|  |  | 76 | Explain the origin, pathway and termination of dorsal column medial lemniscal system  Explain the origin, pathway |
|  |  | 77 | and termination of anterolateral spinothalamic tract. |
|  |  | 78 | Enumerate the descending tracts |
|  |  | 79 | Explain the origin, pathway and termination of pyramidal tracts |
|  |  | 80 | Explain the origin, pathway and termination of extrapyramidal tracts |
|  |  | 81 | Differentiate between pyramidal and extrapyramidal tracts |
| Embryology | Spinal cord | 82 | Discuss the development of alar and basal plate and its derivatives |
| Histology | Spinal cord | 83 | Identify the light microscopic transverse section of spinal cord at cervical, thoracic, lumbar and sacral regions |
|  |  | 84 | Draw and label the transverse section of spinal cord at different levels |
| Physiology | Introduction to Motor Nervous System (General Principles) | 85 | Describe organization of the spinal cord  for motor functions |
|  |  | 86 | Give an overview of the components of nervous system involved in motor control |
|  |  | 87 | Identify and differentiate upper and lower motor neurons |
|  |  | 88 | Describe the types of anterior horn cells |
|  |  | 89 | Describe the concept of Final Common Path |
|  |  | 90 | Describe broad types of motor activities |
|  | Motor functions of Spinal cord I:  Stretch Reflex | 91 | Describe structural organization of the muscle spindle |
|  |  | 92 | Define a reflex action and enlist components of reflex arc. |
|  |  | 93 | Describe types of reflexes and their level of integration. |
|  |  | 94 | Describe Stretch Reflex |
|  |  | 95 | Differentiate between Static (Tonic) and Dynamic (Phasic) stretch reflex |
|  |  | 96 | Describe Functions of muscle spindle |
|  |  | 97 | Discuss physiological significance of these reflexes. |
|  |  | 98 | Describe Functions of Gamma efferent system |
|  |  | 99 | Describe the role of the muscle spindle in  voluntary motor activity |
|  | Motor functions of Spinal cord II:  Golgi Tendon Reflex, Withdrawal Reflexes | 100 | Describe Golgi Tendon Reflex |
|  |  | 101 | Differentiate between muscle spindle and Golgi tendon organ. |
|  |  | 102 | Describe types of polysynaptic reflexes and their level of integration. |
|  |  | 103 | Discuss physiological significance of these reflexes. |
|  |  | 104 | Describe reciprocal inhibition and  reciprocal innervation |
|  | Support of the body against gravity,  Reflexes of Posture And Locomotion | 105 | Describe Positive Supportive Reaction |
|  |  | 106 | Describe Cord “Righting” Reflexes. |
|  |  | 107 | Describe stepping and walking movements |
|  |  | 108 | Describe Excitatory-Inhibitory Antagonism  Between Pontine and Medullary Reticular Nuclei |
|  | Vestibular Sensations and  Maintenance of Equilibrium | 109 | Describe the physiologic anatomy of vestibular apparatus |
|  |  | 110 | Describe function of the utricle and  saccule in the maintenance of static equilibrium |
|  |  | 111 | Describe function of semicircular ducts |
|  |  | 112 | Describe Neuronal Connections of the Vestibular Apparatus |
|  |  | 113 | Describe Vestibular mechanism for stabilizing the eyes |
|  | Lesions of the Spinal Cord:  Upper and Lower Motor Neuron lesion | 114 | Define muscle tone and describe its significance. |
|  |  | 115 | Explain the sequence of events during development of muscle tone. |
|  |  | 116 | Discuss spinal shock |
|  |  | 117 | Differentiate between signs of the upper and lower motor neurons. |
| General medicine | Hemi-section of spinal cord | 118 | Describe the clinical features of Brown Sequard syndrome |
|  |  | 119 | Describe the etiology, clinical features, investigations and management of a patient with paraplegia |
| Skills and affective domain | | | |
| Histology | Transverse section of thoracic segment of spinal cord-2 | 120 | Identify the slide of transverse section of thoracic segments of spinal cord under the microscope |
| Physiology | Examination of deep tendon reflexes-1 | 121 | Examine a standardized patient for deep tendon reflexes of lower limbs |

**Theme- 3 (Syncope)**

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| Gross anatomy | Medulla | 122 | Enlist the components of brain stem |
|  |  | 123 | Describe the external features of brainstem |
|  |  | 124 | Describe the transverse section of medulla at the level of sensory decussation, motor decussation and inferior Olivary nuclei |
|  |  | 125 | Enumerate the cranial nerves nuclei present within the medulla |
|  | Pons | 127 | Describe the transverse section of pons at the level of cranial and caudal parts |
|  |  | 127 | Enumerate the cranial nerves nuclei present within the pons |
|  | Midbrain | 128 | Describe the transverse section of pons at the level of superior colliculus and inferior colliculus |
|  |  | 129 | Enumerate the cranial nerves nuclei present within the midbrain |
| Physiology | Involuntary function of brain | 130 | Describe the involuntary functions of the brain |
|  | Functions of reticular activating system | 131 | Describe the structure and functions of RAS |
|  | Coma and brain death | 132 | Define coma and describe brain death |
|  | The Autonomic Nervous System 1 | 133 | Describe the differences in the locations, level and organization of sympathetic and parasympathetic nervous system. |
|  |  | 134 | Identify the target organs of sympathetic and parasympathetic nervous system. |
|  |  | 135 | Describe the distribution of afferent and efferent sympathetic and parasympathetic fibers to their respective target organs. |
|  |  | 136 | Contrast the sympathetic and parasympathetic branches of the autonomic nervous system based on: spinal cord division of origin, length of preganglionic and postganglionic neurons, neurotransmitters and receptors at the ganglionic and target organ synapse. |
|  | The Autonomic Nervous System 2 | 137 | Discuss basic characteristics of sympathetic and parasympathetic functions |
|  |  | 138 | Describe receptors on the effector organs |
|  |  | 139 | Describe function of the adrenal medullae |
|  |  | 140 | Describe sympathetic and parasympathetic “tone” |
|  |  | 141 | Describe “alarm” or “stress” response of  the sympathetic nervous system |
| Pharmacology | Drugs acting on sympathetic nervous system | 142 | Enlist the drugs acting on SNS and describe their mechanism of actions |
|  | Drugs acting on parasympathetic nervous system | 143 | Enlist the drugs acting on PNS and describe their mechanism of action |
| Forensic medicine | Brain death | 144 | Certify brain death |
|  |  | 145 | Describe the medicolegal importance of brain death |
| Skills and affective domain | | | |
| Histology | Transverse section of lumbar spinal cord-3 | 146 | Identify the slide of transverse section of Lumbar segment of spinal cord under the microscope |
| Physiology | Examination of deep tendon reflexes-2 | 147 | Examine a standardized patient for upper limbs tendon reflexes |

**Theme-4 (Hemiplegia)**

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| Gross anatomy | Cerebrum   * Grey matter of cerebrum * White matter of * cerebrum | 148 | Division of cerebrum into different lobes, its surfaces, sulci and gyri |
|  |  | 149 | Distribution of grey matter in cerebral hemispheres |
|  |  | 150 | Enumerate the types of white matter fibers |
|  |  | 151 | Differentiate between association, projection and commissural fibers |
|  |  | 152 | Detailed account of corpus callosum |
|  | Diencephalon | 153 | Structure and important nuclei of Thalamus and Hypothalamus |
|  | Blood supply of brain | 154 | Describe the formation of circle of Willis |
| Histology | Cerebral cortex | 155 | Identify the cerebral cortex on light microscope |
|  |  | 156 | Enlist the different histological layers of cerebral cortex |
| Physiology | Cortical Control of Motor Functions | 157 | Describe Motor Functions of Specific Cortical Areas |
|  |  | 158 | Describe transmission of signal from the motor cortex to the muscles. (Pyramidal and extrapyramidal). |
|  |  | 159 | Explain the excitation of the spinal cord motor control areas by the primary motor cortex and red nucleus. |
|  | Functions of Descending Tracts | 160 | Describe the functions of Descending Tracts |
|  |  | 161 | Describe Decerebrate and Decorticate Rigidity |
| Community medicine | Risk factors of cerebrovascular diseases | 162 | Describe risk factors for the development of cerebrovascular diseases |
|  |  | 163 | Explain the strategies to prevent cerebrovascular diseases |
| General medicine | Stroke | 164 | Differentiate between hemorrhagic and ischemic stroke |
|  |  | 165 | Describe the etiology, clinical features, investigations and prevention of stroke |
| Skills and affective domain | | | |
| Histology | Cerebral cortex | 166 | Identify the histological layers of cerebral cortex under the microscope |
| Physiology | Examination of motor functions of the brain and spinal cord | 167 | Examine a standardized patient for power, tone and movements of upper and lower limbs, speech, memory and other higher cortical functions |

**Theme- 5 (Tremors)**

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| Gross anatomy | Basal nuclei | 168 | Enumerate the components of basal nuclei  Describe the structure and relation of corpus striatum, red nucleus and substantia nigra |
|  | Cerebellum | 169 | Describe the general features of cerebellum |
|  |  | 170 | Name the lobes of cerebellum and discuss its anatomical and physiological classification |
|  |  | 171 | Enumerate the intracerebellar nuclei of cerebellum |
|  |  | 172 | Describe the input and output of cerebellum |
| Histology | Histology of cerebellum | 173 | Identify the cerebellar cortex on light microscope |
|  |  | 174 | Enlist the different histological layers of cerebellar cortex |
| Physiology | Cerebellum I:  Basic Circuit and Connections | 175 | Describe the divisions of cerebellum into 3 lobes and their connections. |
|  |  | 176 | Describe Interconnections of neurons of cerebellar cortex |
|  |  | 177 | Describe Cerebellar afferent fibers |
|  |  | 178 | Describe Cerebellar efferent fibers |
|  |  | 179 | Describe the functional circuits of cerebellum |
|  | Cerebellum II: Functions and Disorders | 180 | Explain the functional differences between vermis and cerebellar hemispheres. |
|  |  | 181 | Describe Functions of vestibulocerebellum |
|  |  | 182 | Describe Functions of spinocerebellum |
|  |  | 183 | Describe Functions of cerebrocerebellum |
|  |  | 184 | Describe the clinical abnormalities of cerebellum |
|  | Basal Ganglia I: Pathways and connections | 185 | Describe the anatomical and physiological classification of basal ganglia. |
|  |  | 186 | Describe the functional circuits of basal ganglia. |
|  |  | 187 | Describe connections of putamen circuit. |
|  |  | 188 | Describe connections of caudate circuit. |
|  |  | 189 | Enlist the differences between direct and indirect pathways |
|  | Basal Ganglia II: Functions and Diseases | 190 | Describe functions of putamen circuit. |
|  |  | 191 | Describe functions of caudate circuit. |
|  |  | 192 | Explain the clinical problems related to basal ganglia |
| Biochemistry | Phosphosphingolipids | 193 | Describe the metabolism of phosphosphingolipids |
| Pharmacology | Drugs used in Parkinson’s disease | 194 | Describe the groups of drugs used in Parkinson`s disease and their mechanism of actions |
| General medicine | Parkinson`s disease | 195 | Describe the pathology, clinical features and treatment of Parkinson`s disease |
|  |  | 196 | Differentiate between cerebellar and parkinsonian tremors |
| Skills and affective domain | | | |
| Histology | Cerebellar cortex | 197 | Identify the histological layers of cerebellar cortex under the microscope |
| Physiology | Examination of cerebellum | 198 | Illicit cerebellar signs in a standardized patient |

**Theme-6 (Headache)**

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| Gross anatomy | Dural venous sinus | 199 | Differentiate between paired and unpaired venous sinuses  Discuss the structure and drainage of individual venous sinuses |
|  | CSF in ventricular system | 200 | Discuss the structure of choroidal plexus and the formation of CSF in ventricles |
| Physiology | Pain Sensation  Pathways | 201 | Describe pain receptors and type of stimuli causing pain. |
|  |  | 202 | Describe types of pain. |
|  |  | 203 | Explain in detail the pathway for pain. |
|  | Pain suppression (analgesia)  System in the brain and  Spinal cord | 204 | Define analgesia |
|  |  | 205 | Explain pain suppression system in the brain and spinal cord. |
|  |  | 206 | Describe Gate control theory and Brain Opiate system |
|  |  | 207 | Describe clinical abnormalities of pain:  Primary and Secondary Hyperalgesia |
|  | Headache,  Referred Pain | 208 | Define referred pain and describe its mechanism. |
|  |  | 209 | Describe the clinical significance of referred pain with examples. |
|  |  | 210 | Enumerate the causes of referred pain. |
|  |  | 211 | Enlist the causes of intra-cranial and extra-cranial headache and correlate with the underlying mechanism of pain. |
|  | Thermal Sensations | 212 | Describe thermal receptors and their excitation |
|  |  | 213 | Describe mechanism of stimulation of thermal receptors |
|  |  | 214 | Describe transmission of thermal signals  in the nervous system |
|  | Functions of Specific Cortical Areas (Concept of Dominant Hemisphere) | 215 | Name the association areas of brain. Briefly describe their location and function? |
|  |  | 216 | Draw the diagram of cerebral cortex to show the different functional areas |
|  | Language and Speech | 217 | Define and classify speech |
|  |  | 218 | Describe how the brain performs the function of speech. |
|  |  | 219 | Describe Broca’s area in the brain, and its function. |
|  |  | 220 | Describe wernicke’s area in the brain, and its function. |
|  |  | 221 | Describe the speech pathways for perceiving a heard word and then speaking the same word & perceiving a written word and repeating it and correlate it with their clinical significance |
|  |  | 221 | Describe the effects of damage to Broca’s area and Wernicke’s area |
|  |  | 223 | Describe disorders related to speech. |
|  | Learning and Memory | 224 | Define and classify memory and explain its basic mechanism. |
|  |  | 225 | Describe the mechanism of synaptic facilitation and synaptic inhibition |
|  |  | 226 | Describe consolidation of memory, and briefly describe one of its most important features. |
|  |  | 227 | Describe Codifying of new memories |
|  |  | 228 | Role of specific parts of the brain in the memory process |
|  |  | 229 | Explain disorders related to memory. |
|  | Activating-Driving Systems of the Brain | 230 | Describe bulboreticular facilitatory area.  Explain continuous stimulation from lower brain by four neurohormonal systems. |
|  |  | 231 | Explain continuous stimulation from lower brain by four neurohormonal systems. |
|  | Limbic System | 232 | Describe the principal components of the limbic system: hippocampus, amygdala, prefrontal cortex, and nucleus accumbens), the pathways connecting them and their functions. |
|  |  | 233 | Discuss the anatomy of memory and emotion in relation to the limbic system |
|  |  | 234 | Describe Functions of limbic system |
|  |  | 235 | Describe the connection of hypothalamus with different areas of brain. |
|  |  | 236 | Describe the vegetative and endocrine functions of hypothalamus. |
|  |  | 237 | Describe the behavioral functions of hypothalamus. |
|  | Brain Waves and Sleep | 238 | Describe brain waves. |
|  |  | 239 | Describe the clinical significance of EEG. |
|  |  | 240 | Define sleep. Describe its various types and characteristics. |
|  |  | 241 | Describe basic theories of sleep. |
|  |  | 242 | Describe genesis of n-REM and REM sleep. |
|  |  | 243 | Enumerate the neurotransmitters involved in sleep. |
|  |  | 244 | Describe various sleep disorders. |
|  | Seizures and Epilepsy | 245 | Define seizure and epilepsy. |
|  |  | 246 | Classify seizures & epilepsies |
|  |  | 247 | Enumerate causes of seizure and epilepsy. |
|  |  | 248 | Discuss the clinical features of patient presents with epilepsy. |
|  |  | 249 | Discuss the significance of electrophysiologic studies imaging and other investigations in epilepsy. |
|  |  | 250 | Describe briefly about pharmacologic treatment. |
|  | CSF formation, circulation and functions | 251 | Describe regulation of cerebral  blood flow |
|  |  | 252 | Describe formation, flow, and absorption  of cerebrospinal fluid |
|  |  | 253 | Describe Blood–Cerebrospinal Fluid and  Blood-Brain Barriers |
| Biochemistry | CSF | 254 | Describe the biochemical composition of CSF |
|  | Prostaglandins and pain | 255 | Define Prostaglandins |
|  |  | 256 | Describe the role of Prostaglandins in initiation of pain |
| Pathology | Alzheimer’s disease | 257 | Explain the pathogenesis and microscopic findings of Alzheimer`s disease and its types |
|  | Inflammation of brain | 258 | Describe the inflammatory processes related to meninges and brain parenchyma |
|  |  | 259 | Describe the pathogenic mechanisms of meningitis and encephalitis |
| General medicine | Epilepsy | 260 | Explain the types of epilepsy |
|  |  | 261 | Describe the investigations and enlist anti-epileptic drugs |
|  | Hydrocephalus | 262 | Describe the etiology, pathogenesis and clinical features of hydrocephalus |
| Radiology | Neuroradiology- CT scans | 263 | Describe relevant CT scan findings of intracerebral bleeds, hematomas and subarachnoid hemorrhage |
|  |  | 264 | Describe relevant CT scan findings of ischemic strokes |
|  | Neuroradiology- MRI scans | 265 | Describe relevant MR scan findings of intracerebral bleeds, hematomas |
|  |  | 266 | Describe relevant MR scan findings of ischemic strokes |
| Neurosurgery | Brain injuries | 267 | Describe the types, clinical presentations and investigations of a patient with head injury |
|  | Brain and spinal tumors | 268 | Explain the types, clinical features and investigations of brain and spinal tumors |
| Skills and affective domain | | | |
| Histology | Slides of sacral segments and overview of nervous tissues | 269 | Identify the slides of different neural structures under the microscope |
| Physiology | Neurological examination of upper and lower limbs | 270 | Examine a standardized patient for neurological system of upper and lower limbs |