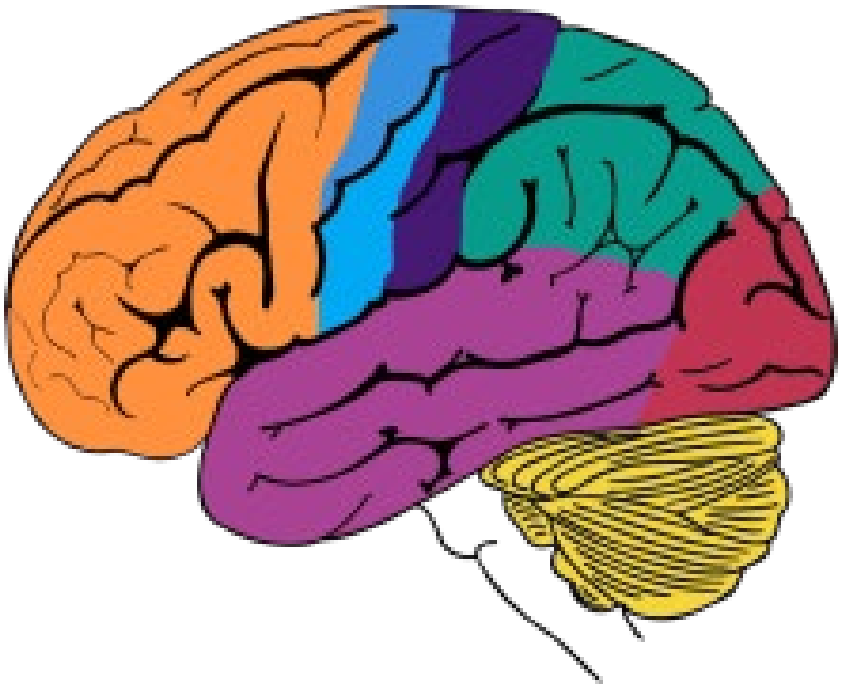
Faisalabad Medical University

BLOCK D

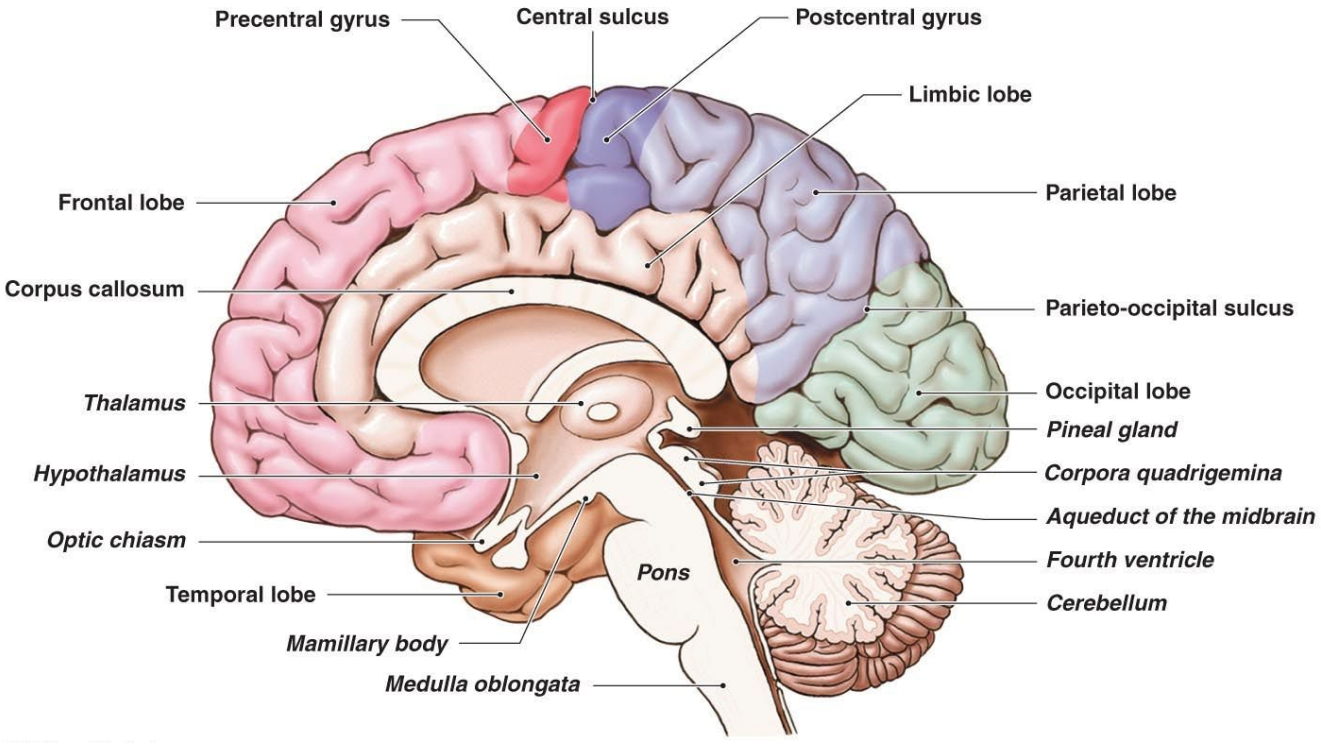
2nd Year MBBS

Contents

NEUROSCIENCES 1A



A midsagittal view showing the inner boundaries of the lobes of the cerebral cortex
(Structures outside of the cerebrum are labeled in italics.)



Module Committee:

Chairperson curriculum committee	Prof. Dr. Humaira Gulnaz	Professor Anatomy
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Pathology	Dr. Amna Ghaffar	Demonstrator Pathology
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Introduction to module:

the Neurosciences module, is an exciting journey through the complexities of the human brain and nervous system. As future healthcare professionals, understanding the intricacies of the nervous system is crucial for diagnosing and managing various neurological disorders. This module will delve into the structure and function of the brain, spinal cord, and peripheral nerves. You will explore the fascinating world of neurons, synapses, and neurotransmitters, and gain insights into the pathophysiology of common neurological conditions. Through lectures, tutorials, and practical sessions, you will develop a solid foundation in neurosciences. By the end of this module, you will be able to apply your knowledge to real-life clinical scenarios and develop essential skills for neurological examination and diagnosis.

Rationale

he Neurosciences module is designed to provide undergraduate medical students with a comprehensive understanding of the structure and function of the nervous system, as well as its role in health and disease.

1. Foundational knowledge: A strong foundation in neurosciences is essential for understanding various neurological disorders and developing effective management strategies.

2. Clinical relevance: Neurological disorders are common and have significant impacts on patients' quality of life. This module will enable students to develop essential skills for neurological examination, diagnosis, and management.

3. Interdisciplinary connections: Neurosciences is an interdisciplinary field that draws on knowledge from anatomy, physiology, biochemistry, pharmacology, and psychology. This module will highlight these connections and promote an integrated understanding of the nervous system.

4. Development of critical thinking and problem-solving skills: Through case-based learning and problem-solving exercises, students will develop critical thinking and analytical skills essential for diagnosing and managing complex neurological disorders.

5. Preparation for clinical practice: This module will prepare students for clinical rotations in neurology, psychiatry, and other related specialties, where they will encounter patients with various neurological disorders."

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 the 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 the autonomic nervous system

7) Describe the blood supply and venous drainage of the brain and spinal cord

8) Describe the organization, structure, and functions of the motor system of the brain and spinal cord

9) Explain the organization, structure, and functions of the 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 the 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 the spinal cord, cerebral, and cerebellar cortex

14) Examine the nervous system of a standardized patient (sensations, motor functions, and higher cortical functions and tendon reflexes)

List Of Themes

LIST OF THEMES		
Sr. no.	Themes	Duration
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

Sr.no.	Subject	Topic	Learning objectives	Teaching strategies	Duration	Assessment
Theme 1 Numbness and tingling						
	Anatomy	Overview of CNS	Describe the divisions of the nervous system and their components and briefly describe how they function. Enumerate structures within spinal and cranial cavities. Define ventricles and CSF. Define coverings of the brain and spinal cord.	Interactive Lecture	1 hour	MCQ
	Anatomy	Neurons and Neuroglia	Describe the structure of the neuron Classify the supporting cells. Enumerate their functions	Interactive Lecture	1 hour	MCQ
	Anatomy	Structure of Nerve and Concept of Myelinated and Unmyelinated Fibers	Describe the structure of the Nerve Explain the Myelination of nerve Fiber. Describe the importance of Myelination transmitter at pre-synaptic terminal	Interactive Lecture	1 hour	MCQ
	Physiology	Organization of the Nervous System	Describe the general design of the nervous system. Describe various divisions of the nervous system. Describe structural and functional units of CNS. Describe Functional components of Neuron. Describe Functional and Structural classification of Neurons. Describe major levels of central nervous system function. Describe Glial cells and their functions.	Interactive Lecture	1 hour	MCQ
	Physiology	Basic Functions of Synapses	Define and classify synapses. Explain physiological structure of synapse. Describe Mechanism by Which action Potential Causes Transmitter Release from the Presynaptic Terminals Describe synaptic transmission and explain properties of synaptic transmission.	Interactive Lecture	1 hour	MCQ

			Describe the mechanism of action of neurotransmitter on the post synaptic membrane. Describe Second messenger system in the post synaptic neuron			
	Physiology	Functions of Neurotransmitters	Define the characteristics of a neurotransmitter. Enumerate the neurotransmitters involved in the central nervous system. Classify neurotransmitters and describe the actions of some common neurotransmitters in central nervous system.	Interactive Lecture	1 hour	MCQ
	Physiology	Electrical Events during Neuronal Excitation and Inhibition	Describe resting membrane potential of the neuronal soma. Describe Effect of Synaptic Excitation on the Postsynaptic Membrane—Excitatory Postsynaptic Potential. Describe Effect of Inhibitory Synapses on the Postsynaptic Membrane—Inhibitory Postsynaptic Potential. Describe Generation of Action Potentials in the Initial Segment of the Axon Leaving the Neuron—Threshold for Excitation	SGD	1 hour	MCQ
	Physiology	Sensory Receptors	Define and classify receptors. Classify receptors according to their location in the body. Describe specific functions of receptors. Describe Receptor or generation potential. Discuss mechanism of action of sensory transduction.	Interactive Lecture	1 hour	MCQ
	Physiology	Coding of Sensory Information	Describe Doctrine of specific nerve energies Describe Modality of Sensation—The “Labeled Line Principle” Define and discuss law of projection. Discuss properties of stimulus, modality, Stimulus location Stimulus intensity Stimulus duration	Interactive Lecture	1 hour	MCQ

			Describe Frequency of action potentials with threshold level of receptor potential			
	Physiology	Transmission and Processing of Signals in CNS	Describe Relaying of signals through Neuronal pools; Divergence, Convergence, Prolongation of Signals	Interactive Lecture	1 hour	MCQ
	Physiology	Types of nerve fibers, its regeneration and degeneration	Describe the mechanism of degeneration & regeneration. Describe the duration required for regeneration inside & out of CNS. Enumerate the causes of degeneration. Discuss Wallerian degeneration. Identify the microscopic appearance of degenerating neurons	SGD	2 hours	MCQ
	Physiology	Somatic Sensations	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	Interactive Lecture	1 hour	MCQ
	Physiology	Transmission in the Dorsal column–medial Lemniscal system	Describe ascending pathways and enumerate the differences between the two. Describe Transmission in the Dorsal column medial Lemniscal system. Describe Spatial Orientation of the Nerve Fibers in the Dorsal Column–Medial Lemniscal System Describe two-point discrimination	Interactive Lecture	1 hour	MCQ
	Physiology	Somatosensory Cortex	Identify the diagrammatic representation of different areas of the body in the somatosensory cortex I Identify Broadman's areas of cerebral cortex and correlate each one of them with their respective functions. Describe the functions of somatosensory area I.	Interactive Lecture	1 hour	MCQ

			Describe layers of the somatosensory cortex and their function. Describe the functions of somatosensory association area			
	Physiology	Transmission of Sensory signals in the Anterolateral pathway	Differentiate the sub modalities of no discriminative touch, temperature and nociception based on receptor transduction mechanism, localization within the spinal gray matter, and central termination of the pathways. Describe functional organization at all levels and sub-modalities served by the anterolateral system and the equivalent components of the spinal trigeminal system.	Interactive Lecture	1 hour	MCQ
	Biochemistry	Neurotransmitters **I**	Describe the Metabolism of epinephrine and norepinephrine, creatinine, histamine,	Interactive lecture	1 Hours	MCQS
	Biochemistry	Neurotransmitters **II**	Describe the Metabolism of gamma-aminobutyrate (GABA), serotonin, melatonin, and melanin	Interactive lecture	1 Hours	MCQS
	Biochemistry	Neurotransmitters	Explain the biosynthesis of different neurotransmitters	SGD (1)	2 hours	MCQS
	Pathology	Cellular Pathology of the Central Nervous System	Reactions of Neurons to Injury Reactions of Astrocytes to Injury Reactions of Microglia to Injury Reactions of Other Glial Cells to Injury	Interactive Lecture	1 hour	MCQ
	General medicine	Approach to a patient with neuropathy	Analyze and discuss the classifications and patterns of neuropathy, including their causes, affected nerve types, clinical presentations, and how they influence diagnosis and management strategies. Describe clinical features, investigations and management options of neuropathy	Interactive Lecture	1 hour	MCQ
	Biochemistry	Sampling	Enumerate and demonstrate skills in sampling and	Skill lab	2 hours	OSPE

			preservation of blood and urine samples			
	Physiology	How to approach a patient General physical examination	Explain the purpose and process of the physical examination to the patient. Obtain informed consent. Position the patient appropriately. Learn and practice proper inspection, palpation, and auscultation techniques. Implement a systematic approach to the physical examination	Skill lab	2 hours	OSPE
Theme 2 Paraplegia						
	Anatomy	Structure of Spinal Cord-I	Describe the gross appearance of spinal cord. Enumerate the meninges covering the spinal cord. Explain change in the length of spinal cord from birth till puberty. Enumerate the various nuclei present in the Anterior Posterior and Lateral gray column. Correlate each nucleus with its function. Describe the structure of white matter in spinal cord. Explain the route of transmission of sensory information from the peripheral sensory endings through different parts of nervous system. Enumerate the major ascending and descending tracts of spinal cord	Interacti ve Lecture	1 hour	MCQ
	Anatomy	Structure of Spinal Cord-II	Demonstrate the structure of spinal cord on a given model. Explain why the arrangement of gray and white matter is different at thoracic and upper lumbar region. Explain the arrangement of the ascending and descending tract at mid cervical level.	Interacti ve Lecture	1 hour	OSPE MCQ

			Explain the component of a reflex arc. Correlating the role of reflex arc in maintaining the muscle tone			
	Embryology	Development of Spinal Cord I	Describe the development of neural tube. Describe the differentiation of neural tubes into different parts of the brain. Describe the development of spinal cord. Describe the positional changes of the cord	Interactive Lecture	1 hour	MCQ
	Anatomy	Ascending Tracts of Spinal Cord	Explain the pathways for Discriminative touch, Light touch and pressure, and Muscle joint sensations. Describe the effects of lesions of complete transaction of the cord center of the cord	Interactive Lecture	1 hour	MCQ
	Embryology	Developmental Anomalies of Spinal Cord II	Explain the causes of neural tube defects. Explain the processes of development of spin bifida. Describe the clinical conditions relevant to the development of neural tube defects	Interactive Lecture	1 hour	MCQ
	Anatomy	Descending Tracts of Spinal Cord	Describe the anatomical location of first order neuron, second order neuron and third order neuron with the help of diagrams. Explain the pathways for Voluntary skilled movements. Describe the effects of lesions of these pathways. Describe the effects of upper and lower motor neuron lesions	Interactive Lecture	1 hour	MCQ
	Anatomy	Injuries of Spinal Cord	Relate various signs and symptoms with the lesions of the nervous system. Classify various spinal cord injuries. Enumerate the signs and symptoms of upper and	SGD	2 hours	MCQ

			lower motor neuron lesions. Enumerate various syndromes affecting the normal function of the spinal cord. Correlate the motor and sensory deficits with the affected neuronal pathways at the level.			
	Anatomy	Cranial Cavity	Describe the boundaries of anterior, middle, and posterior cranial fossae. Describe the bones forming an inferior view of skull on the given bone. Mark the foramina at the base of the skull and enumerate the contents of clinically relevant foramina.	Skill Lab	2 hours	OSPE
	Embryology	Development of Skull	Describe the stages of development of neurocranium. Describe the stages of development of viscerocranium. Describe the stages of differentiation of neurocranium into membranous neurocranium and chondrocranium. Describe the importance of fontanelle of skull in relation to normal ossification of the skull. Describe the changes in intracranial pressure during labor. Describe the features of Newborn Cranium	Interactive Lecture	1 hour	MCQ
	Physiology	Introduction to Motor Nervous System (General Principles)	Describe the organization of the spinal cord. for motor functions Give an overview of the components of the nervous system involved in motor control. Identify and differentiate upper and lower motor neurons. Describe the types of anterior horn cells.	Interactive Lecture	1 hour	MCQ

			Describe the concept of the Final Common Path Describe broad types of motor activities			
	Physiology	Motor functions of Spinal cord I: Stretch Reflex	Describe structural organization of the muscle spindle. Define a reflex action and enlist components of reflex arc. Describe types of reflexes and their level of integration. Describe Stretch Reflex Differentiate between Static (Tonic) and Dynamic (Phasic) stretch reflex. Describe Functions of muscle spindle Discuss the physiological significance of these reflexes. Describe the Functions of Gamma efferent system. Describe the role of the muscle spindle in voluntary motor activity	Interactive Lecture	1 hour	MCQ
	Physiology	Motor functions of Spinal cord II: Golgi Tendon Reflex, Withdrawal Reflexes	Describe Golgi Tendon Reflex Differentiate between muscle spindle and Golgi tendon organ. Describe types of polysynaptic reflexes and their level of integration. Discuss the physiological significance of these reflexes. Describe reciprocal inhibition and reciprocal innervation	Interactive Lecture	1 hour	MCQ
	Physiology	Support of the body against gravity, Reflexes of Posture and Locomotion	Describe Positive Supportive Reaction Describe Cord “Righting” Reflexes. Describe stepping and walking movements. Describe Excitatory-Inhibitory Antagonism Between Pontine and Medullary Reticular Nuclei	Interactive Lecture	1 hour	MCQ
	Physiology	Vestibular Sensations and Maintenance of Equilibrium	Describe the physiological anatomy of vestibular apparatus.	Interactive Lecture	1 hour	MCQ

			Describe the function of the utricle and saccule in the maintenance of static equilibrium Describe function of semicircular ducts Describe Neuronal Connections of the Vestibular Apparatus Describe Vestibular mechanism for stabilizing the eyes			
	Physiology	Lesions of the Spinal Cord: Upper and Lower Motor Neuron lesion	Define muscle tone and describe its significance. Explain the sequence of events during development of muscle tone. Discuss spinal shock. Differentiate between signs of the upper and lower motor neurons.	Interactive Lecture	1 hour	MCQ
	Biochemistry	Glycerophospholipids	Describe the biochemical composition of Glycerophospholipids	SGD (2)	2 hours	MCQS
	General medicine	Approach to a patient of cord compression and hemiplegia	Discuss differences between paresis and plegia. Discuss the terminology • Hemiplegia • Quadriplegia • Paraplegia • Diplegia Discuss the differences between UMN and LMN lesion	Interactive Lecture	1 hour	MCQ
			Describe the etiology, clinical features, investigations, and management of a patient with paraplegia and quadriplegia			
	Biochemistry	Micro pipetting	Enumerate principles and clinical uses. Demonstrate the skill of on Micro pipetting	Skill lab (2)	2 hours	OSPE
	Physiology	Examination of sensory system	Examine the sensations (tactile, position, pain, thermal, vibration) of lower limb on a standardized patient	Skill lab	2 hours	OSPE
	Histology	Histology of Spinal Cord	Identify the microscopic features of spinal cord on a given slide.	Skill lab	2 hours	OSPE

			List two points of identification for each slide. Draw a labeled diagram of the identified tissue on the histology notebook with the help of H&E pencils.			
Theme 3 syncope						
	Embryology	Development of Brain Stem	Describe the development of medulla, pons midbrain and cerebellum. Describe the developmental changes in alar and basal plates in the brainstem. Enlist the anomalies associated with it	Interactive Lecture	1 hour	MCQ
	Anatomy	Structure of Medulla	Identify the gross features of medulla on a given model. Explain the gross features of medulla on a given model. Explain the internal structure of medulla. Correlate the significance of raised pressure in posterior cranial fossa to its effects on medulla oblongata.	SGA SGD	2 hours	OSPE MCQ
	Anatomy	Structure of Pons	Identify the gross features of pons on a given model. Explain the internal structure of pons. Discuss the anatomical structures involved in Pontine hemorrhage.	SGA SGD	2 hours	OSPE MCQ
	Anatomy	Blood Supply of Spinal Cord and Brain Stem	Describe the blood supply of different parts of brain stem and spinal cord. Describe the course and branches of Internal carotid artery, vertebral artery, basilar artery.	Interactive Lecture	1 hour	MCQ
	Anatomy	Structure of Mid Brain	Identify the gross structure of midbrain on a given model. Explain the internal structure of midbrain.	SGA SGD	2 hours	OSPE MCQ

			Explain the clinical consequences of trauma to midbrain. Discuss the involvement of nuclei of midbrain with the blockage of cerebral aqueduct.			
	Anatomy	Organization of Cranial Nerve Nuclei	Describe the motor and sensory nuclei of the cranial nerves. Describe different components of the cranial nerves and their functions. Describe the crossed extensor reflex along with its neuronal mechanism. Describe reciprocal inhibition and innervations. Describe the postural and locomotive reflexes.	Interactive Lecture	1 hour	MCQ
	Physiology	Involuntary function of brain	Describe the involuntary functions of the brain	Interactive Lecture	1 hour	MCQ
	Physiology	Functions of reticular activating system	Describe the structure and functions of RAS	Interactive Lecture	1 hour	MCQ
	Physiology	Coma and brain death	Define coma and describe brain death	SGD	2 hours	MCQ
	Physiology	The Autonomic Nervous System 1	Describe the differences in the locations, level and organization of sympathetic and parasympathetic nervous system. Identify the target organs of sympathetic and parasympathetic nervous system. Describe the distribution of afferent and efferent sympathetic and parasympathetic fibers to their respective target organs. 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.	Interactive Lecture	1 hour	MCQ

	Physiology	The Autonomic Nervous System 2	Discuss basic characteristics of sympathetic and parasympathetic functions. Describe receptors on the effector organs. Describe the function of the adrenal medullae. Describe sympathetic and parasympathetic "tone." Describe "alarm" or "stress" response of the sympathetic nervous system	Interactive Lecture	1 hour	MCQ
	Biochemistry	Phosphosphingolipids Phospholipids I Sphingophospholipids	Describe the metabolism of phosphosphingolipids	SGD (3)	2 hours	MCQS
	Biochemistry	Phospholipids **II**	Describe the synthesis of phospholipids (Phosphatidylcholine and phosphatidylethanolamine), synthesis of glycerol. ether phospholipids (cardiolipin and platelet activating factor)	Interactive lecture	1 hour	MCQS
	Biochemistry	Phospholipids **III**	Explain the degradation of phospholipids, deficiency of lung surfactant, metabolism of glycolipids, biosynthesis of ceramide, sphingomyelin, and gangliosides, and degradation of sphingolipids along with sphingolipidoses	Interactive lecture	1 hour	MCQS
	Pharmacology	Synthesis and action of adrenergic and cholinergic neurotransmitters at the level of synapse	Explain the characteristics of transmitter synthesis, storage, release, and termination of action at cholinergic and noradrenergic nerve terminals Identify the site of action of different drugs at cholinergic and adrenergic synapses	Interactive lecture	1 hour	MCQS
	Pharmacology	Characteristics of important cholinoreceptor and adrenoreceptor in PNS	Explain Cholinergic receptor subtypes, their sites and characteristics of their mechanism of action Explain adrenoceptor types and subtypes and characteristics of their mechanism of action	Interactive lecture	1 hour	MCQS

	Forensic medicine	Brain death	Certify brain death. Describe the medicolegal importance of brain death	Interactive lecture	1 hour	MCQS
Skills and affective domain						
	Physiology	Examination of reflexes	Examine a standardized patient for deep tendon reflexes of upper and lower limbs	Skill lab	2 hours	OSPE
	Biochemistry	Spectrophotometry	Enumerate principles and clinical uses. Demonstrate the skill of on spectrophotometer machine	Skill lab (3)	2 hours	OSPE
	Anatomy	Introduction to Brain Stem	Enumerate the various parts of the brainstem. Explain the internal structure of brain stem with the help of diagrams. Discuss the positions of several cranial nerve nuclei, the olivary nuclear complex, and various nerve tracts as they ascend to the higher brain centers or descend to the spinal cord.	Skill Lab	2 hours	OSPE
Theme 4 Hemiplegia / Aphasia						
	Anatomy	Diencephalon	Describe gross features of parts of diencephalon, thalamus, and hypothalamus. Correlate the anatomical lesions of nuclei of thalamus and hypothalamus with the clinical conditions like diabetes insipidus and obesity	SGD	2 hours	OSPE MCQ
	Anatomy	Third Ventricle of brain	Describe its boundaries. Explain its connection and flow of CSF	SGD	2 hours	MCQ
	Anatomy	Gross Features of Cerebral Hemisphere	Describe the gross features of the surfaces of cerebrum. Describe the gross features of the lobes of cerebrum. Identify the main sulci and gyri of cerebral hemispheres on the given model. Explain the phenomenon of cerebral dominance	SGD	2 hours	MCQ OSPE
	Anatomy	Gross Anatomy of White Matter of Cerebrum	Classify the cerebral fibers according to their connections.	Interactive Lecture	1 hour	MCQ

			Describe the features of commissural fibers, association fibers, projection fiber. Explain the effects of lesions of different parts of internal capsule			
	Anatomy	Areas of brain	Identify the location of major sensory and motor areas within specific lobes with the help of dissection	SGD SGA	2 hours	MCQ OSPE
	Anatomy	Blood Supply of Cerebrum	Describe the blood supply of different parts of cerebrum. Explain the formation and importance of veins draining cerebrum. Explain the formation of circle of Willis. Explain boundaries and contents of interpeduncular fossa. Explain the features of anterior cerebral artery occlusion. Middle cerebral artery occlusion	Interacti ve Lecture	1 hour	MCQ
	Anatomy	Lateral Ventricles of Brain	Enumerate ventricles of the brain Describe the relations and boundaries of each ventricle Describe the formation of choroid plexus	SGD	2 hours	MCQ
	Embryolog y	Development of Cerebrum	Describe the development of cerebral hemispheres and ventricles. Explain the relation between congenital aqueduct stenosis and hydrocephalus. Explain the congenital anomalies associated with development of cerebrum.	Interacti ve Lecture	1 hour	MCQ
	Anatomy	1-6 Cranial Nerves	Trace the pathway of Olfactory nerve from the nucleus to target organs on a model.	SGD	2 hours	OSPE, MCQ

			Describe the formation of olfactory bulb and olfactory tract. Correlate the effects of lesion of olfactory nerve with special reference to clinical conditions causing anosmia. Trace the course of olfactory nerves from the olfactory receptor nerve cells in the olfactory mucous membrane to the cerebral cortex. Trace the course of optic nerve from the axons in the ganglionic layer of the retina to cerebral cortex. Enumerate the nuclei of oculomotor, trochlear and abducent nerve. Enumerate the nuclei of 5th cranial nerve			
	Anatomy	Limbic System and RAS	Define reticular activating system. Explain the structure of the reticular formation. Explain the strategic importance of location of reticular activating system among the important nerve tracts and nuclei. Enumerate various components of the limbic system. Explain the location all parts with the help of diagram.	Interactive Lecture	1 hour	MCQ
	Anatomy	7-12 cranial nerves	Enumerate the nuclei of 7th and 8th nerves. Describe the intracranial course of each nerve. Enumerate the nuclei of 9th, 10th 11th and 12th cranial nerves. Describe the intracranial course of each nerve.	SGD	2 hours	MCQ
	Physiology	Cortical Control of Motor Functions	Describe Motor Functions of Specific Cortical Areas Describe transmission of signals from the motor cortex	Interactive Lecture	1 hour	MCQ

			to the muscles. (Pyramidal and extrapyramidal). Explain the excitation of the spinal cord motor control areas by the primary motor cortex and red nucleus.			
	Physiology	Functions of Descending Tracts	Describe the functions of Descending Tracts Describe Decerebrate and Decorticate Rigidity	Interactive Lecture	1 hour	MCQ
	Biochemistry	de novo Synthesis of purines and pyrimidines	Explain the salvage pathways of nucleotide synthesis	Interactive lecture	1 hour	MCQS
	Biochemistry	Purine Nucleotide synthesis and degradation	Describe degradation of purine and pyrimidine nucleotides	Interactive lecture	1 hour	MCQS
	Biochemistry	Disorders associated with purine nucleotide metabolism	Describe adenosine. deaminase deficiency, purine nucleoside phosphorylase deficiency and its clinical importance	Interactive lecture	1 hour	MCQS
	Biochemistry	Hyperuricemia-Gout	Discuss the normal levels of serum Uric acid in the blood and effects of abnormal levels. Describe the etiology, pathogenesis, and clinical features of Gout	SGD (4)	2 Hours	MCQS
	General medicine	Approach to a patient with CVA	Define hemiplegia Discuss etiological classification of stroke Differentiate between hemorrhagic, embolic and thrombotic stroke ischemic stroke Discuss clinical manifestations, investigations and management of stroke disorders	Interactive Lecture	1 hour	MCQ
			Discuss the primary and secondary prevention of stroke			
	Biochemistry	Ultraviolet spectrophotometry	Enumerate and demonstrate principles and clinical uses of Ultraviolet spectrophotometry	Skill lab (4)	2 hours	OSPE
	Physiology	Examination of motor functions of the brain and spinal cord	Examine a standardized patient for power, tone and movements of upper and lower limbs, speech, memory, and other higher cortical functions	Skill lab	2 hours	OSPE
	Anatomy	Thalamus	Enumerate its various nuclei.	Skill lab	2 hours	OSPE, MCQ

			Explain its division. Enumerate its various connections. Explain clinical conditions related to it			
	Anatomy	Hypothalamus	Enumerate its various nuclei. Explain its division. Enumerate its various connections. Explain clinical conditions related to it	Skill lab	2 hours	OSPE, MCQ
	Anatomy	Imaging of CNS	Describe the appearance of different parts of the brain in: Radio graphs MRI CT	Skill Lab	2 hours	OSPE
Theme 5 Tremors						
	Anatomy	Ventricle (4th)	Describe the boundaries of ventricle. Enumerate various nuclei present at this level. Describe its communications. Explain flow of CSF	Interactive Lecture	1 hour	MCQ
	Anatomy	Basal Ganglia	Describe the various basal nuclei. Explain the position of the different basal nuclei with the help of diagrams showing lateral view of dissected cerebral hemisphere. Explain the relationships of the different basal nuclei. Enumerate the connections of various basal nuclei. Define Hyperkinetic and hypokinetic disorders.	Interactive Lecture	1 hour	MCQ

			Correlate the neuronal degeneration with the development of Parkinsonism.			
	Physiology	Cerebellum I: Basic Circuit and Connections	Describe the divisions of cerebellum into 3 lobes and their connections. Describe Interconnections of neurons of cerebellar cortex. Describe Cerebellar afferent fibers. Describe Cerebellar efferent fibers. Describe the functional circuits of cerebellum.	Interactive Lecture	1 hour	MCQ
	Physiology	Cerebellum II: Functions and Disorders	Explain the functional differences between vermis and cerebellar hemispheres. Describe Functions of vestibulocerebellum Describe Functions of spinocerebellum Describe Functions of cerebrocerebellum Describe the clinical abnormalities of cerebellum	Interactive Lecture	1 hour	MCQ
	Physiology	Basal Ganglia I: Pathways and connections	Describe the anatomical and physiological classification of basal ganglia. Describe the functional circuits of basal ganglia. Describe connections of putamen circuit. Describe connections of caudate circuit. Enlist the differences between direct and indirect pathways	Interactive Lecture	1 hour	MCQ
	Physiology	Basal Ganglia II: Functions and Diseases	Describe functions of putamen circuit. Describe functions of caudate circuit. Explain the clinical problems related to basal ganglia	Interactive Lecture	1 hour	MCQ
	Biochemistry	Natural and synthetic derivatives of purines and pyrimidines	Discuss the natural and synthetic derivatives of purines and pyrimidines and their role in health and disease	SGD (5)	2 Hours	MCQS
	Pharmacology	Drugs used in the treatment of Parkinson's disease	Enlist the groups used in treatment of parkinsonism Explain the mechanism of action of these drugs	Interactive Lecture	1 hour	MCQ

	General medicine	Approach to a patient with movement disorders	Discuss hypokinetic and hyperkinetic disorders Describe the pathophysiology, clinical features and treatment of Parkinson`s disease	Interactive Lecture	1 hour	MCQ
	Community medicine	Risk factors of cerebrovascular diseases	Enlist cerebrovascular diseases Describe risk factors for the development of cerebrovascular diseases Discuss the prevention and control measures	Interactive Lecture	1 hour	MCQ
	Physiology	Examination of cerebellum	Illicit cerebellar signs in a standardized patient	Skill lab	2 hours	OSPE
	Biochemistry	Uric Acid	Perform and interpret the test of uric acid. Memories the reference ranges of uric acid	Skill lab (5)	2 hours	OSPE
	Anatomy	Cerebellum	Explain the features of lobes of cerebellum on the given model. Explain the gross anatomical features of cerebellar cortex. Explain the cerebellar afferent fibers & efferent fibers. Discuss the anatomical lesion within the parts of cerebellum with disturbance of voluntary movements	Skill Lab		OSPE MCQ
	Anatomy	Histology of Cerebellum and Cerebrum	Identify the microscopic features of cerebellum on a given slide. Identify the histological features of cerebrum under microscope. List two points of identification for each slide. Draw a labeled diagram of the identified tissue on the histology notebook with the help of H&E pencils.	Skill Lab	2 hours	OSPE
Theme 6 Headache						
	Anatomy	Meninges of brain 1	Explain the meninges of brain on the given model. Explain the Dural reflections with special	SGD	1 hour	MCQ

			emphasis on tentorium cerebelli and falx cerebri. Explain the features of spaces within meninges. Define Meningitis Explain the structures encountered during lumbar puncture. Co-relate the significance of anatomical attachments in relation to meningitis			
	Anatomy	Venous Sinuses of Brain	Explain the attachments of Dural venous sinuses of brain with the help of diagrams. Describe the important relations with the help of diagrams. Discuss the involvement of the facial vein with the occlusion of venous sinuses. Correlate the absence of venous valves in dural venous sinuses to the metastasis of tumor cells.	SGD	1 hour	MCQ
	Anatomy	Gross Anatomy of ANS-I	Describe the autonomic nervous system. Enlist the differences between sympathetic and parasympathetic system.	Interactive Lecture	1 hour	MCQ
	Physiology	Pain Sensation Pathways	Describe pain receptors and types of stimuli causing pain. Describe types of pain. Explain in detail the pathway for pain.	Interactive Lecture	1 hour	MCQ
	Physiology	Pain suppression (analgesia) System in the brain and Spinal cord	Define analgesia. Explain pain suppression system in the brain and spinal cord. Describe Gate control theory and Brain Opiate system. Describe clinical abnormalities of pain: Primary and Secondary Hyperalgesia	Interactive Lecture	1 hour	MCQ
	Physiology	Headache, Referred Pain	Define referred pain and describe its mechanism. Describe the clinical significance of referred pain with examples.	Interactive Lecture	1 hour	MCQ

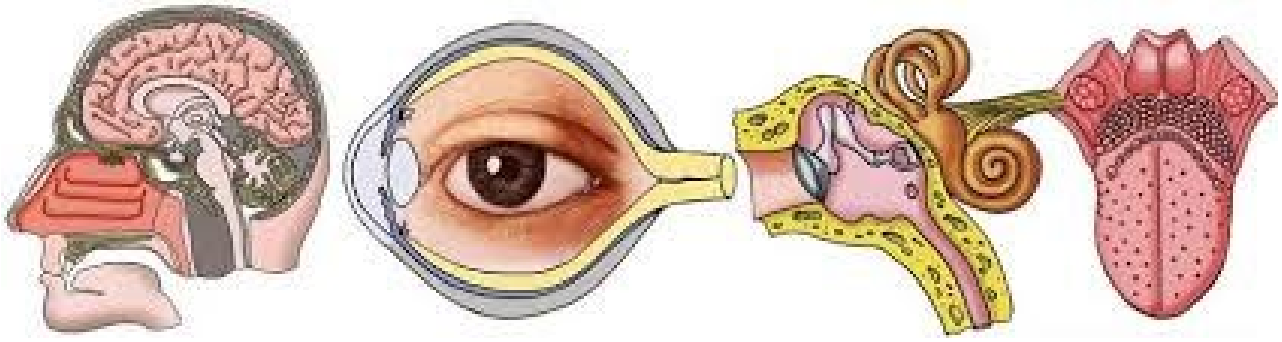
			Enumerate the causes of referred pain. Enlist the causes of intra-cranial and extra-cranial headache and correlate with the underlying mechanism of pain.			
	Physiology	Thermal Sensations	Describe thermal receptors and their excitation. Describe mechanism of stimulation of thermal receptors Describe transmission of thermal signals in the nervous system	Interactive Lecture	1 hour	MCQ
	Physiology	Functions of Specific Cortical Areas (Concept of Dominant Hemisphere)	Name the association areas of brain. Briefly describe their location and function. Draw the diagram of cerebral cortex to show the different functional areas	Interactive Lecture	1 hour	MCQ
	Physiology	Language and Speech	Define and classify speech. Describe how the brain performs the function of speech. Describe Broca's area in the brain, and its function. Describe Wernicke's area in the brain, and its function. 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. Describe the effects of damage to Broca's area and Wernicke's area. Describe disorders related to speech.	Interactive Lecture	1 hour	MCQ
	Physiology	Learning and Memory	Define and classify memory and explain its basic mechanism. Describe the mechanism of synaptic facilitation and synaptic inhibition. Describe consolidation of memory, and briefly describe one of its most important features.	Interactive Lecture	1 hour	MCQ

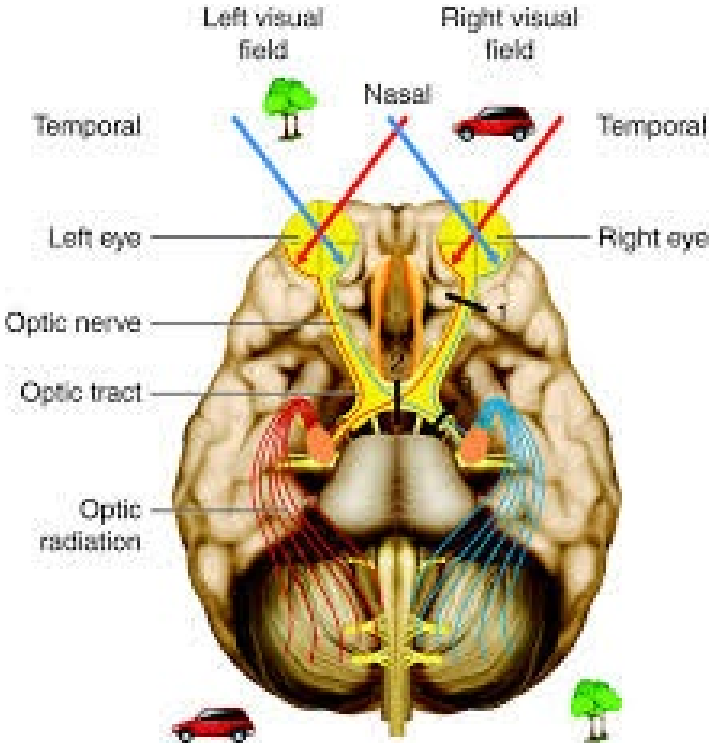
			Describe Codifying of new memories Role of specific parts of the brain in the memory process Explain disorders related to memory.			
	Physiology	Activating-Driving Systems of the Brain	Describe bulboreticular facilitatory area. Explain continuous stimulation from lower brain by four neurohormonal systems. Explain continuous stimulation from lower brain by four neurohormonal systems.	Interactive Lecture	1 hour	MCQ
	Physiology	Limbic System	Describe the principal components of the limbic system: hippocampus, amygdala, prefrontal cortex, and nucleus accumbens, the pathways connecting them and their functions. Discuss the anatomy of memory and emotion in relation to the limbic system. Describe Functions of limbic system Describe the connection of hypothalamus with different areas of brain. Describe the vegetative and endocrine functions of hypothalamus. Describe the behavioral functions of hypothalamus.	Interactive Lecture	1 hour	MCQ
	Physiology	Brain Waves and Sleep	Describe brain waves. Describe the clinical significance of EEG. Define sleep. Describe its various types and characteristics. Describe basic theories of sleep. Describe the genesis of n-REM and REM sleep. Enumerate the neurotransmitters involved in sleep. Describe various sleep disorders.	Interactive Lecture	1 hour	MCQ
	Physiology	Seizures and Epilepsy	Define seizure and epilepsy. Classify seizures & epilepsies.	SGD	2 hours	MCQ

			Enumerate causes of seizure and epilepsy. Discuss the clinical features of patients present with epilepsy. Discuss the significance of electrophysiologic studies imaging and other investigations in epilepsy. Describe briefly about pharmacologic treatment.			
	Physiology	CSF formation, circulation, and functions	Describe regulation of cerebral blood flow. Describe formation, flow, and absorption. of cerebrospinal fluid Describe Blood–Cerebrospinal Fluid and Blood-Brain Barriers	SGD	2 hours	MCQ
	Biochemistry	Eicosanoids	Describe synthesis of eicosanoids, their regulation, and functions along with their biomedical importance.	Interactive lecture	1 hour	MCQS
	Biochemistry	Prostaglandins and pain	Define Prostaglandins Describe the role of Prostaglandins in initiation of pain	SGD (4)	2 Hours	MCQS
	Pathology	Alzheimer's disease	Explain the pathogenesis and microscopic findings of Alzheimer`s disease and its types	Interactive Lecture	1 hour	MCQ
	Pathology	Inflammation of brain	Describe the inflammatory processes related to meninges and brain parenchyma. Describe the pathogenic mechanisms of meningitis and encephalitis			
	General medicine	Approach to a patient with seizures	Define seizure and epilepsy Discuss ILAE classification of epilepsy Discuss differential diagnosis of seizures Discuss approach to a 1st seizure in a patient	Interactive Lecture	1 hour	MCQ
			Describe the investigations of a patient with epilepsy Enlist anti-epileptic drugs and their mechanism of action, choice of AEDs and side effects			

	Radiology	Neuroradiology-CT scans	Describe relevant CT scan findings of intracerebral bleeds, hematomas, and subarachnoid hemorrhage. Describe relevant CT scan findings of ischemic strokes	Interactive Lecture	1 hour	MCQ
		Neuroradiology-MRI scans	Describe relevant MR scan findings of intracerebral bleeds, hematomas. Describe relevant MR scan findings of ischemic strokes			
	Neurosurgery	Brain injuries	Describe the types, clinical presentations, and investigations of a patient with head injury	Interactive Lecture	1 hour	MCQ
		Brain and spinal tumors	Explain the types, clinical features and investigations of brain and spinal tumors			
	Biochemistry	Centrifugation	Enumerate different types of centrifugations along with their principles and clinical uses. Demonstrate the skill of centrifugation	Skill lab (6)	2 hours	OSPE
	Physiology	Examination of superficial reflexes	Examine a standardized patient for superficial reflexes	Skill lab	2 hours	OSPE
	Anatomy	Meninges of Brain-II	Describe the attachments of meninges with the help of dissection. Explain the supratentorial and infratentorial compartments of tentorium cerebelli with the help of dissection. Describe the extradural and subdural hematoma. Explain Dural origins of headache.	Dissection/ Skill lab	2 hours	OSPE

Neurosciences-1B Module





Module committee

Chairperson curriculum committee	**Dr. Humaira Gulnaz**	**Professor Anatomy**
Curriculum Coordinator	Dr. Ayesha Ayub	In charge HPERD
Module coordinator	Dr. Sidra Latif	Senior Demonstrator Physiology
Academic team members		
Biochemistry	Dr. Tahira Bashir	Senior Demonstrator Biochemistry
Anatomy	Dr. Uzma	Assistant Professor Anatomy
Physiology	Dr. Sidra Latif	Senior Demonstrator Physiology
Community medicine	Dr. Fozia Zahur Malik	Demonstrator Community Medicine
ENT	Dr. Zahid Gill	Associate professor ENT
Ophthalmology	Dr. Farah Huma	Senior registrar ophthalmology
Pediatric surgery	Dr. Muhammad Ismail	
Medicine	Dr. Zaheer Ahmad	Senior Registrar Medicine
Behavioral sciences	Dr. Sinha	PGR Psychiatry

	LIST OF THEMES	
SR. no.	**THEMES**	**Duration**
1)	Facial palsy (face, 5th and 7th cranial nerves)	1 week
2)	Neck swelling (thyroid, larynx, neck, muscles etc.)	1 week
3)	Cleft palate (palate, tongue, pharynx)	1 week
4)	Anosmia	
5)	Diplopia / blindness (2nd, 3rd, 4th, 6th cranial nerve / eyeball / orbit)	1 week
6)	Deafness (ear / 8th nerve)	1 week

Introduction

The Neurosciences module, an exciting journey through the complexities of the human brain and nervous system. As future healthcare professionals, understanding the intricacies of the nervous system is crucial for diagnosing and managing various neurological disorders. This module will delve into the structure and function of the brain, spinal cord, and peripheral nerves. You will explore the fascinating world of neurons, synapses, and neurotransmitters, and gain insights into the pathophysiology of common neurological conditions. Through lectures, tutorials, and practical sessions, you will develop a solid foundation in neurosciences. By the end of this module, you will be able to apply your knowledge to real-life clinical scenarios and develop essential skills for neurological examination and diagnosis.

Rationale

The Neurosciences module is designed to provide undergraduate medical students with a comprehensive understanding of the structure and function of the nervous system, as well as its role in health and disease. The rationale for this module is as follows:

1. Foundational knowledge: A strong foundation in neurosciences is essential for understanding various neurological disorders and developing effective management strategies.

2. Clinical relevance: Neurological disorders are common and have significant impacts on patients' quality of life. This module will enable students to develop essential skills for neurological examination, diagnosis, and management.

3. Interdisciplinary connections: Neurosciences is an interdisciplinary field that draws on knowledge from anatomy, physiology, biochemistry, pharmacology, and psychology. This module will highlight these connections and promote an integrated understanding of the nervous system.

4. Development of critical thinking and problem-solving skills: Through case-based learning and problem-solving exercises, students will develop critical thinking and analytical skills essential for diagnosing and managing complex neurological disorders.

5. Preparation for clinical practice: This module will prepare students for clinical rotations in neurology, psychiatry, and other related specialties, where they will encounter patients with various neurological disorders.

General learning outcomes

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

1) Describe the structure of vertebrae, skull bones palate, pharynx, larynx, facial bones, and base of the skull.
2) Describe the contents walls and boundaries of anterior and posterior triangles of the neck.
3) Describe the structure, relation, blood supply and venous drainage of thyroid.
4) Describe the arteries, veins and nerves of the neck including cervical plexuses.
5) Describe the nuclei, course, relations, and structures supplies by all cranial nerves.
6) Describe the origin, course, relations, and structures supplies by the arteries, veins and lymphatics of head and neck.
7) Describe the anatomy of all the muscles of facial expression and head and neck.
8) Describe the structure and functions of eye, ears, nose, and paranasal sinuses.
9) Describe the development of different structures of organs of the head and neck.
10) Identify the microscopic structure of salivary glands and tongue.
11) Examine a standardized patient`s cranial nerves.
12) Demonstrate Perimetry and Audiometry.

Sr.no.	Subject	Topic	Learning objectives	Teaching strategies	Duration	Assessment
Theme 1 Facial palsy (face, 5th and 7th cranial nerves)						
	Anatomy	Gross Anatomy of scalp	Enumerate layers of scalp Describe gross features of each layer. Describe the course of arteries, veins and nerves supplying the scalp with the help of model. Describe the danger area of the scalp. Describe the role of occipitofrontalis in preventing spread of scalp Infections towards neck	Interactive lecture	1 Hours	MCQS
	Anatomy	Gross anatomy of face	Describe the muscles of face along with their nerve supply with the help of models. Describe the actions of muscles of face. Describe the course of arteries, veins and nerves supplying the face with the help of model. Describe the features of Facial Infections and Cavernous Sinus Thrombosis	SGD	2 hours	MCQS
	Anatomy	Blood supply and lymphatic drainage of face	Describe the course and branches of arteries supplying the face. Describe the venous drainage of face. Describe the venous communication of face and its effects. Describe the lymphatic drainage of face	Interactive lecture	1 Hours	MCQS
	Gross Anatomy	Extra cranial course of trigeminal nerve	Trace the pathway of Trigeminal nerve from nucleus to target organs.	Interactive lecture	1 Hours	MCQS

			Enumerate the divisions of trigeminal nerve Describe the features of Trigeminal Neuralgia Describe the pathway of mandibular, maxillary & ophthalmic divisions from nucleus to target organs. Describe the lesions of nerves with special reference to infections of molar teeth.			
	Gross Anatomy	Extra cranial course of CN VII	Describe the extra cranial course of CN VII along with its clinical importance	Interactive lecture	1 Hours	MCQS
	Embryology	Development of face1	Discuss the five facial primordia.	Interactive lecture	1 Hours	MCQS
	Embryology	Development of face2	Describe the inter-maxillary segment. Describe the embryological defects in the development of face			
	Biochem.	Replication I	Describe steps of replication in prokaryotes Enumerate proteins for the separation of DNA strands. Describe the proofreading mechanism.	Interactive lecture	1 Hours	MCQS
	Biochem.	Replication II	Describe eukaryotic DNA polymerases. Explain the telomer with telomerase. Describe the mechanism of telomer shortening	Interactive lecture	1 Hours	MCQS
	Biochem.	Transcription I	Explain prokaryotic RNA polymerase. Describe different steps in prokaryotic transcription	Interactive lecture	1 hours	MCQS
	Biochem	Central dogma	Discuss the structural basis of cellular information.	SGD	2 hours	MCQS

			Types of DNA, DNA organization, and karyotyping			
	Medicine	Bell`s palsy	Describe the clinical features and management of Bell`s palsy			
Skills and affective domain						
	Anatomy	Skull anterior and lateral view	Describe the bones forming the anterior view of skull on the given bone. Mark the main anatomical landmarks like orbit, nasal cavity and oral cavity and mark their boundaries. Describe the bones forming posterior view of skull on the given bone. Mark the main anatomical landmarks like internal occipital protuberance, lambdoid suture, and superior nuchal lines on the given bone. Describe the bones forming the lateral view of skull on the given bone. Describe the boundarie of temporal and infra temporal fossa and pterygopalatine fossa on the given bone. Mark the bones forming pterion and explain clinical importance of pterion with the help of diagram.	Skill lab	2 hours	MCQS
	Anatomy	Base of skull	Describe the bones forming inferior view of skull on the given bone. Describe the attachments on the base of skull. Mark the foramina at the base of skull and	Skill lab	2 hours	MCQS

			enumerate the contents of clinically relevant foramina.			
	Anatomy	Norma frontalis	Enlist the bones present in norma frontalis. Enumerate the external boundaries of nose and orbit. Describe the zygomatic arch	Skill Lab	2 hours	MCQS
	Physiology	Examination of Cranial nerves, V, VII (trigeminal, facial)	Examine the cranial nerves V & VII on a standardized patient	Skill lab	2 hours	OSPE
	Biochem.	Infrared spectrometry	demonstrate principal and clinical uses of infrared spectrometry	Skill lab	2 hours	OSPE
Theme 2 Neck swelling (thyroid, larynx, neck, muscles etc.)						
	Gross Anatomy	Deep fascia of neck	Enumerate the layers of deep cervical fascia. Describe the layers of deep cervical fascia along with its clinical importance	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Ant. triangle of neck	Enlist the subdivisions of anterior triangle of neck. Describe the boundaries and contents of each triangle	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Post triangle of neck	Enlist the subdivisions of posterior triangle of neck. Describe the boundaries and contents of each triangle	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Blood supply of neck	Describe the course, Distribution and branches of main arteries of neck. Describe the course, Draining and tributaries of main veins of neck	Interactive lecture	1 hour	MCQS

	Gross Anatomy	Nerves of neck	Describe the cervical plexus along with its branches and distribution	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Lymphatic drainage of head and neck	Describe the lymphatic drainage of head and neck	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Surface marking of neck	Mark surface markings of: I. Subclavian vessels II. Common carotid artery III. Internal carotid artery IV. External carotid artery V. Internal juggler vein VI. Vagus nerve VII. Thyroid gland Trachea	SGD	1 hour	MCQS
	Gross Anatomy	Sub mandibular region	Describe the muscles present in the submandibular region and sublingual region with the help of model. Enumerate the nerves vessels and ganglion in submandibular and sublingual region. Describe their distribution on a given model.	Interactive lecture	1 hour	MCQS

	Biochem.	Transcription II	Describe the synthesis of eukaryotic RNA transcript	Interactive lecture	1 hour	MCQS
	Biochem.	Post-transcriptional modification	Describe the synthesis of mature tRNA and rRNA. Explain mRNA splicing in eukaryotes	Interactive lecture	1 hour	MCQS
	Biochem.	DNA repair	Discuss DNA damage and its repair. Discuss different types of mutation and their consequences.	SGD	2 hours	MCQS
	ENT	Lump in neck	Approach to a patient with lump in the neck	Interactive lecture	1 hour	MCQS
Skills and affective domain						
	Gross Anatomy	Typical & atypical cervical vertebra	Describe the bony features of typical & atypical cervical vertebrae. Name the joints formed by them. Describe the attachments	Skill lab	2 hours	OSPE
	Gross Anatomy	Pterygopalatine fossa	Name the boundaries of pterygopalatine fossa. Enumerate the contents of pterygopalatine fossa. Describe the relations & communications of pterygopalatine fossa	Skill lab	2 hours	OSPE
	Gross Anatomy	Larynx	Name the paired and unpaired cartilages of larynx. Enumerate the ligaments and membrane of larynx. Describe the nerve and blood supply of larynx. Enumerate the intrinsic and extrinsic muscle of larynx along with its actions and nerve supply.	Skill lab	2 hours	OSPE

			Describe the clinical aspects related to it along with different spaces and fossa			
	Biochem.	Collection of samples	Demonstrate the skill of collection of urine sample and preservation	Skill lab	2 hours	OSPE
	Physiology	Examination of Cranial nerves XI (accessory), XII (Hypoglossal)	Examine a standardized patient for Cranial nerves XI, XII	Skill lab	2 hours	OSPE
Theme 3 Cleft palate (palate, tongue, pharynx) **Theme 4 Anosmia**						
	Gross Anatomy	Pharynx	Enumerate the division of pharynx. Describe the boundaries of each division. Describe the attachment, action and nerve supply of pharynx. Describe the clinical significance of each division	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Extra cranial course of IX, X, XI & XII	Describe the extra cranial course of nerves. Describe clinical significance of each nerve	Interactive lecture	1 hour	MCQS
	Embryology	Pharyngeal apparat Us 1	Describe the components of pharyngeal apparatus. Describe the development of pharyngeal apparatus. Enlist the derivatives of 1st each pharyngeal arch.	Interactive lecture	1 hour	MCQS

			Define the terms pharyngeal arch, pouch, cleft and membrane. Enlist the derivatives of 1st ,2nd, 3rd and 4th pharyngeal pouches			
	Embryology	Pharyngeal apparat Us 2	Enlist the derivatives of 2nd, 3rd & 4th each pharyngeal arch. Define the terms pharyngeal arch, pouch, cleft and membrane. Enlist the derivatives of 1st ,2nd, 3rd and 4th pharyngeal pouches.	Interactive lecture	1 hour	MCQS
	Embryology	Pharyngeal apparat Us 3	Discuss the arterial supply and innervation of the pharyngeal arches. Describe the pharyngeal membranes. Discuss the branchial cyst, sinuses, and fistula. Describe the 1st arch developmental defects	Interactive lecture	1 hour	MCQS
	Embryology	Palate	Describe the development of primary and secondary palate. Discuss the developmental defects of lip and primary, secondary palate	Lecture	1 hour	MCQS
	Embryology	Development of nose	Describe the development of nasal cavities and paranasal air sinuses.	Lecture	1 hour	MCQS

			Describe the development of nasolacrimal groove, duct, and sac. Enlist developmental defects of nose			
	Biochem.	Translation 1	Describe the genetic code, components of the translational machinery, and wobble hypothesis.	Interactive lecture	1 hour	MCQS
	Biochem.	Translation 11	Explain the steps involved in translation	Interactive lecture	1 hour	MCQS
	Biochem.	Post-translational modification	Describe protein targeting and mechanism of mature functional protein.	Interactive lecture	1 hour	MCQS
	Biochem.	Blotting techniques	Discuss southern blotting, northern blotting, western blotting	SGD	2 hours	MCQS
	Physiology	Sense of Smell	Describe olfactory membrane. Explain the mechanism of excitation of the olfactory cells. Discuss Rapid Adaptation of Olfactory Sensations. Define threshold for smell. Describe transmission of smell signals into the central nervous system Describe primitive and newer olfactory pathways into the central nervous system. Describe centrifugal control of activity in the olfactory bulb by the central nervous system.	SGD	2 hours	MCQS
	Physiology	Sense of Taste	Discuss primary sensations of taste.	SGD	2 hours	MCQS

			Explain threshold for taste. Describe the taste bud and its function. Describe mechanism of stimulation of taste buds Describe transmission of taste signals into the central nervous system			
	ENT	Sinusitis	Describe the causes and clinical features of acute and chronic sinusitis	Interactive lecture	1 hour	MCQS
	Pediatric surgery	Cleft palate	Describe the pathogenesis, clinical features, and management of a patient with cleft palate	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Palate	Name the bones forming the hard palate. Describe the soft palate along with its muscles, attachments, and nerve supply. Describe the relations of palate. Describe the relations of palate. Name the neurovascular supply of palate	Skill Lab	2 hours	MCQS
	Gross Anatomy	Nose and paranasal sinuses1	Describe the external features of nose. Describe the boundaries of nasal cavity. Describe the relations of nose with other structures. Describe the lateral wall of nose.	Skill lab	2 hours	MCQS

			Describe the blood supply and nerve supply of lateral wall of nose			
	Gross Anatomy	Nose and paranasal sinuses2	Describe the medial wall of nose. Describe the nerve and blood supply of medial wall. Describe the paranasal sinuses along with their contents. Describe their openings and applied aspects related to them	Skill Lab	2 hours	MCQS
	Anatomy	Olfactory Nerve	Trace the pathway of Olfactory nerve from nucleus to target organs on a model. Describe the formation of olfactory bulb and olfactory tract. Correlate the effects of lesion of olfactory nerve with special reference to clinical conditions causing anosmia	Skill Lab	1 hour	MCQS
	Histology	Retina	Able to identify structure under microscope. Able to make Histological diagram	Skill lab	1 hour	MCQS
	Physiology	Examination of Cranial nerves I, IX, X (olfactory, glossopharyngeal, vagus)	Examine a standardized patient for cranial nerve I, IX, X examination (sense of smell, taste, gag reflex)	Skill lab	2 hours	OSPE

	Biochem.	ELISA	Enumerate and discuss the principle and its clinical applications.	Skill lab	2 hours	OSPE
Theme 5 Diplopia / blindness (2nd, 3rd, 4th, 6th cranial nerve / eyeball / orbit)						
	Gross Anatomy	Lacrimal apparatus	Enumerate the structures forming lacrimal apparatus. Describe the gross features of each part of lacrimal apparatus. Describe the nerve supply of lacrimal apparatus. Co relates the anatomical structures of lacrimal apparatus with the features of blocked Lacrimal duct	SGD	2 hours	MCQS
	Gross Anatomy	Extra cranial course of CN III, IV, VI	Describe the course of optic, oculomotor, trochlear and abducent nerve with clinical importance. Describe Ciliary Ganglion	Lecture	1 hour	MCQS
	Histology	Eye 1	Enlist different histological layers of the eye. Describe Histological structure of Fibrous and uveal layer	Lecture	1 hour	MCQS
	Histology	Eye 2	Enlist different layers of retina.	Lecture	1 hour	MCQS

			Describe Histological structure of each layer of retina			
	Embryology	Development of Eye 1	Introduction of lens & retina	Lecture	1 hour	MCQS
	Embryology	Development of eye 2	Development of optic nerve, ciliary body & Iris	Lecture	1 hour	MCQS
	Embryology	Development of eye 3	Development of choroid, sclera, aqueous chamber & cornea	Lecture	1 hour	MCQS
	Embryology	Development of eye 4	Development of vitreous and eyelids Anomalies of eye	Lecture	1hr	MCQS
	Physiology	Physical Principles of Optics	Describe refraction at interface between two media. Describe the physical principles of optics. Apply refractive principles to lenses. Describe Focal Length of a Lens Explain formation of image by convex lenses Explain how to measure refractive power of a lens	Interactive lecture	1 hour	MCQS
	Physiology	Optics of The Eye	Explain lens system of the eye. Describe the concept of "Reduced" Eye. Explain accommodation reflex. Explain presbyopia. Describe that "depth of focus" of the lens system increases with decreasing pupillary diameter. Define visual acuity. Explain the determination of distance of an object from the eye-— "DEPTH PERCEPTION"	Interactive lecture	1 hour	MCQS

			Describe errors of refraction			
	Physiology	Fluid System of The Eye—Intraocular Fluid	Describe the formation of aqueous humor by the ciliary body. Describe the outflow of aqueous humor from the eye. Describe Regulation of Intraocular Pressure and Glaucoma	SGD	2 hours	MCQS
	Physiology	Anatomy and Function of The Structural Elements of The Retina	Describe foveal region of the retina and its importance in acute vision. Discuss the functional parts of the Rods and Cones. Describe blood supply of the retina—the central retinal artery and the choroid	Interactive lecture	1 hour	MCQS
	Physiology	Photochemistry of Vision	Explain rhodopsin-retinal visual cycle and excitation of the rods. Explain the role of vitamin A for formation of rhodopsin. Describe excitation of the rod when rhodopsin is activated by light. Describe receptor potential, and logarithmic relation of the receptor potential to light intensity. Describe mechanism by which rhodopsin decomposition decreases membrane sodium conductance—the excitation "cascade." Explain dark and light adaptation.	Interactive lecture	1 hour	MCQS

	Physiology	Color Vision	Describe photochemistry of color vision by the cones Explain tricolor mechanism of color detection. Explain Young-Helmholtz theory of color vision. Explain color blindness.	Interactive lecture	1 hour	MCQS
	Physiology	Neural Function of The Retina	Describe different neuronal cell types and their functions. Describe the visual pathway from the cones to the ganglion cells. Discuss the retinal neurotransmitters. Discuss retinal ganglion cells and their respective fields. Describe lateral inhibition. Explain excitation of ganglion cells. Discuss on and off response of ganglion cells.	Interactive lecture	1 hour	MCQS
	Physiology	Visual Pathways	Discuss the function of the dorsal lateral geniculate nucleus of the thalamus. Describe organization and function of the visual cortex. Describe primary visual cortex. Describe secondary visual areas of the cortex. Describe two major pathways for analysis of visual information: (1) the fast "position" and "motion" pathway and (2) the accurate color pathway. Describe neuronal patterns of stimulation	Interactive lecture	1 hour	MCQS

			during analysis of the visual image. Discuss detection of color			
	Physiology	Eye Movements and Their Control	Describe muscular control of eye movements. Describe neural pathways for control of eye movements. Describe fixation movements of the eyes. Explain the mechanism of involuntary locking fixation role of the superior colliculi. Explain "Fusion" of the visual images. from the two eyes Describe neural mechanism of stereopsis for judging distances of visual objects	Interactive lecture	1 hour	MCQS
	Physiology	Autonomic control of Accommodation and pupillary aperture	Describe autonomic nerves to the eyes. Describe control of accommodation Describe control of pupillary diameter Discuss Pupillary reflexes or reactions in central nervous system disease.	Interactive lecture	1 hour	MCQS
	Biochem.	Gene regulation I	Explain lac operon, trp. operon for gene expression and regulation	Interactive lecture	1 hour	MCQS
	Biochem.	Coordination of gene regulation and expression	Explain stringent response. Explain regulation through ribosomal proteins	Interactive lecture	1 hour	MCQS

	Biochem.	Gene regulation II	Explain cis-acting elements and trans-acting factors with different motifs. Explain regulation with different receptors	Interactive lecture	1 hour	MCQS
	Biochem.	Molecular biological techniques	DNA cloning, recombinant DNA technology, PCR	SGD	2 Hours	MCQS
	Community medicine	Prevention of blindness	Enlist the causes of blindness Discuss the prevention of community blindness	Interactive lecture	1 hour	MCQS
	Medicine	Approach to a patient with Bell`s palsy and ocular nerve palsies	Describe the clinical features and management of Bell`s palsy Discuss differences between upper motor neuron and lower motor neuron facial nerve palsy Discuss management options for management of bell's palsy Describe the clinical features and etiology of 3, 4 and 6th nerve palsies	Interactive lecture	1 hour	MCQS
	Ophthalmology	Approach to a patient with blindness	Define and classify blindness. Enlist the essential component of history-taking Discuss differential diagnosis Explain the early detection and prevention strategies	Interactive lecture	1 hour	MCQS
	Gross Anatomy	Bony orbit	Name the bones forming the bony orbit. Identify the foramina, fissures, and fossae associated with the orbit	Skill lab	2 hours	OSPE

			and what are the structures transmitted through these openings. Name the contents of orbit			
	Gross Anatomy	Eyeball 1	Name the layers of eyeball. Describe each layer of eyeball. Describe the chambers and eyeball. Describe the secretion and drainage of aqueous humor and vitreous humor	Skill lab	2 hours	OSPE
	Gross Anatomy	Eyeball 2	Describe the neurovascular supply of eye. Describe the intra and extraocular muscles with their attachment, actions, and nerve supply	Skill lab	2 hours	OSPE
	Histology	Cornea	Able to identify under microscope. Able to make and label histological diagram of cornea	Skill lab	2 hours	MCQS
	Histology	Retina	Able to identify under microscope. Able to make and label histological diagram of Retina	Skill lab	2 hours	MCQS
	Physiology	Visual Acuity	Examine a standardized patient for visual acuity and errors of refraction	Skill lab	2 hours	OSPE
	Physiology	Perimetry	Examine a standardized patient for visual field function	Skill lab	2 hours	OSPE
	Physiology	Color vision	Examination of color vision	Skill lab	2 hours	OSPE

	Physiology	Ophthalmoscopy	Examination of ophthalmoscopy	Skill lab	2 hours	OSPE
	Biochem.	Polymerase chain reaction	Enumerate and demonstrate PCR, its procedure, clinical uses	Skill lab	2 hours	OSPE
Theme 6 Deafness (ear / 8th nerve)						
	Embryology	Development of ear 1	Development of external ear Developmental anomalies of external ear	Lecture	1 hour	MCQS
	Embryology	Development of ear 2	Development of Middle ear Developmental anomalies of middle ear	Lecture	1 hour	MCQS
	Embryology	Development of ear 3	Development of internal ear Developmental anomalies of internal ear	Lecture	1 hour	MCQS
	Histology	Ear	Enlist parts of ear Describe the histology of each part	Lecture	1 hour	MCQS
	Gross Anatomy	Middle ear 2		SGD	2 hours	MCQS
	Physiology	Tympanic Membrane and The Ossicular system	Explain conduction of sound from the tympanic membrane to the cochlea. Describe "Impedance Matching" by the Ossicular System. Describe attenuation of sound by contraction of the tensor tympani and stapedius muscles. Describe the transmission of sound through bone.	Interactive lecture	1 hour	MCQS
	Physiology	Cochlea	Describe functional anatomy of the cochlea. Describe basilar membrane and resonance in the cochlea.	Interactive lecture	1 hour	MCQS

			Describe transmission of sound waves in the cochlea— "traveling wave." Describe pattern of vibration of the basilar membrane for different sound frequencies. Describe an amplitude pattern of vibration of the basilar membrane. Describe function of the organ of corti. Describe Excitation of the Hair Cells Discuss the "place" principle. Describe detection of changes in loudness—the power law. Describe threshold for hearing sound at different frequencies.			
	Physiology	Auditory Nervous Pathways	Describe an auditory pathway. Explain the function of the cerebral cortex in hearing. Describe how to determine the direction from which sounds come. Describe transmission of centrifugal signals from CNS to lower auditory centers. Describe different types of deafness.	Interactive lecture	1 hour	MCQS
	Biochem.	Gene regulation III	Explain eukaryotic transcriptional and translational regulation	Interactive lecture	1 hour	MCQS
	Biochem.	Oncogenes	Explain oncogenes in carcinogenesis. Mechanism of action of oncogenes.	Interactive lecture	1 hour	MCQS
	Biochem.	Tumor suppressor genes	Explain tumor suppressor genes and oncogenic viruses. Importance of tumor markers	Interactive lecture	1 hour	MCQS

	Biochem.	Restriction fragment length polymorphism	Discuss restriction fragment length polymorphism. Discuss its application	SGD	2 Hours	MCQS
	ENT	Hearing loss	Describe different clinical tests for hearing loss. Describe the etiology and management of conduction and sensorineural hearing loss			
	Gross Anatomy	External ear	Describe the auricle. Describe the external auditory meatus with clinical importance. Describe neurovascular supply of external ear	Skill Lab	2 hours	MCQS
	Gross Anatomy	Middle ear	Name the boundaries of middle ear. Describe each boundary. Enlist contents of middle ear Describe Bony Ossicles Enlist its communications. Describe Auditory tube. Describe its neurovascular supply	Skill Lab	2 hours	MCQS
	Gross Anatomy	Internal ear	Describe the bony labyrinth. Describe membranous labyrinth. Describe its neurovascular supply. Describe extra cranial course of VIII cranial nerve	Skill Lab	2 hours	MCQS
	Histology	Ear	Able to identify under microscope.	Skill lab	2 hours	MCQS

			Able to make and label histological diagram			
	Physiology	Examination of Cranial Nerves III, IV and VI	Examine a standardized patient for oculomotor, Abducens and Trochlear nerves with an ophthalmoscope	Skill lab	2 hours	OSPE
	Physiology	Examination of hearing and vestibulocochlear nerve (VIII)	Examine a standardized patient for hearing loss with tuning fork (Weber and Rinne`s test) Audiometry	Skill lab	2 hours	OSPE
	Biochem.	Electrophoresis	Enumerate and demonstrate the principle, procedure, and clinical application	Skill lab	2 hours	OSPE

Assessment Plan:

Subjects	NS-1A	NS-1B	Total MCQs
Gross Anatomy	21	17	38
Histology	6	5	11
Embryology	3	5	8
Physiology	27	18	45
Biochemistry	2	3	5
PRIME including Research	3	2	5
Medicine	1	1	2
Pharmacology	1	0	1
Pathology	1	0	1
Forensic medicine	1	0	1
EYE	0	1	1
ENT	0	1	1
Pediatric surgery	0	1	1
Total	**66**	**54**	**120**

Block D OSPE Blueprint

Modules	Specialty	List of Practical	No. of stations	Total
NS-1A	**Anatomy**	Osteology Nerve and Muscles Surface anatomy Embryology models Radiology	2	**4**
		Histology	1	
		Viva stations	1	

	Physiology	Superficial and Deep tendon reflexes Sensory and motor system examination	3	**4**
		Viva stations	1	
	Biochemistry	Viva stations	1	**1**
NS-1B	**Anatomy**	Osteology Nerve and Muscles Surface anatomy Radiology	2	**4**
		Histology	1	
		Viva stations	1	
	Physiology	Cranial nerves examination Ophthalmoscopy Colour vision. Visual acuity Perimetry Tuning fork test	3	**4**
		Viva stations	1	
	Biochemistry	Viva stations	1	**1**
Total			**18**	**18**

Internal Assessment Pattern

Sr. No.	Criteria	Numbers
	Theory:	
1.	Attendance (>90%=3,80-89%=2,70-79%=1, <70%=0)	3
2.	Creative work/assignments/Task	2
3.	Continuous Assessment throughout the block (Formative assessments, Viva Voce, departmental activities)	2
4.	Block examination theory	3
5.	Pre prof Examination of block	4
	Total	**14**
Sr. No.	**Criteria**	**Numbers**
OSPE:		
1.	Attendance (>90%=3,80-89%=2,70-79%=1, <70%=0)	3
2.	Logbook/practical copy	3
3.	Discipline, Responsibility and teamwork	2
4.	Block examination OSPE	2
	Total	**10**