RIHS MEDICAL & DENTAL COLLEGE
INTEGRATED CURRICULUM

NEUROSCIENCES MODULE 20301

Session 2022-23

SECOND YEAR MBBS

STUDY GUIDE

PLANNED AND DESIGNED BY:

PROF. DR. SABIHA M HAQ

Module 20203: Neurosciences module

Session 2022-23

Placement in curriculum: Module code: 20301 (Year 2, block code- 03, module code 01) Pre-requisite: First year modules, First & Second block of second year

	Disciplines	Name of Faculty
1.	Principal & HOD Ophthalmology	Prof. Dr. Shakaib Anwar
2.	Anatomy	Prof. Dr. Sabiha M. Haq
3.	Physiology	Prof. Dr. Jan Alam
4.	Biochemistry	Prof. Dr. Rehan Khawaja
5.	Pathology	Prof. Dr. Bushra
6.	Pharmacology	Prof. Dr. Azam Zia
7.	Community Medicine	Prof. Dr. Mirza Inamul Haq
8.	Forensic Medicine	Dr. Sabika Husain
9.	Behavioral Sciences	Ms. Nargis Munir
10.	Medical & Allied	Prof. Dr. Nadia Shams
11.	Surgery & Allied	Prof. Dr. Shaukat
Module duration		07 Weeks

Module planner	**Prof. Dr. Sabiha M Haq**
Module co-planner	**Prof. Dr. Mirza Inamul Haq**
Module Coordinator	**Dr. Maria Sarfaraz**
Integrated Curriculum	The Integrated Curriculum is becoming an increasingly popular concept internationally in the field of Medicine. The goal of integration is to break down barriers between the basic and clinical sciences, currently in practice as a result of traditional curricular models. Integration should promote retention of knowledge and acquisition of skills through repetitive and progressive development of concepts and their applications. There are three areas in need of improvement and clarification for successful integration: 1. Ensuring synchronous presentation of teaching material 2. Avoiding the tendency to diminish the importance of the basic sciences, and 3. Using unified definitions (MEDICAL TEACHER) The model adapted in this institution is an **Integrated, modular, system based, spiral curriculum.** Arrangement of spirals: Two years + one year + two years
Students as a curriculum Coordinator and class representative	Student involvement in an integrated curriculum is the key to the process of making him a self-directed, competent and ethical learner who can adjust and compete with the latest trends in medical education in today's and tomorrow's world. In order to achieve this: 1. Students will help the Module coordinators in accomplishing all tasks assigned to him/her. 2. They will be a part of curriculum planning and implementing team. 3. They will inform/discuss the ongoing activities /problems in teaching and learning with module coordinators and curriculum chairperson.

Module Rationale	The human nervous system is the most complex and versatile achievement of the process of evolution. The nervous system of all animals, functions to detect changes in the external and internal environment and to bring about appropriate responses in the muscles, organs and glands. The anatomical, physiological, biochemical and molecular foundation of some of these aspects of neural function are well understood, while others continue to occupy the professional lives of many thousands of researchers in both the basic and clinical sciences. This module is expected to build the student's basic knowledge about the normal structure, organization, functions and development of nervous system. This knowledge will serve as a fabric on which the student will weave further knowledge about the etiology, pathology and pathogenesis of diseases of nervous system and the principles of their management.
Module Outcomes	At the end of the module the students should be able to **KNOWLEDGE:** • Describe the Anatomical divisions of the nervous system and their components • Describe the gross anatomical features of Cerebrum, Midbrain, Pons, Medulla and Spinal cord • Describe the sensory and motor parts of nervous system • Describe the major levels of central nervous system along with their functions • Describe the integrative function of nervous system • Describe formation, flow and absorption of CSF • Describe the blood cerebrospinal fluid and blood brain barriers • Describe the structure of Nerve and explain the Myelination of nerve fibre • Describe the ascending and descending tracts of brain stem • Describe analgesia system in brain & spinal cord • Describe the mechanism of consolidation of memory

	• Describe the functions of autonomic nervous system **SKILL:** • Draw a labeled diagram of the identified structures with the help of eosin and hematoxylin pencils on the histology notebooks • Mark the main Anatomical land marks on skull • Demonstrate the ability to use the variety of resources (faculty, library, text books and internet) **ATTITUDE:** 1. Demonstrate the professional attitude, team dynamism and good communication in dissection hall, library and during practicals
Teaching and Learning methodology	**Large Group Interactive Sessions (LGIS):** The goal of INTERACTIVE LECTURE is to engage the students' attention, through ways to interact with the content, the instructor, and their classmates. Accordingly, INTERACTIVE LECTUREs include segments of knowledge transfer, combined with segments where students interact. One of the things that makes the lecture interactive is the ability of the instructor to select the content of the lecture segments based on the students' needs. This demands a prior search for the baseline knowledge of the students at the start of the lecture. If students have difficulty answering a question, or an activity fails to develop the concept in most student groups, it's time to find a new and better way to deal with the material. INTERACTIVE LECTURE clearly gives a better concept of the content and keeps students' attention captured throughout, as compared to yester years' didactic lectures. **Small Group Discussion (SGD):** The purpose and technique of small group teaching is to keep it learner-centered, with all students joining in free discussion on a particular topic. A typical 'small group' is around eight to 12 learners facilitated by a teacher. The steps of SGD are Forming, Storming, Norming & Performing. The teacher acts only as a facilitator. Students are allowed to use their books or other search material during the discussion. SGD is a good method

	to clear the concepts and develop communication and conflict solving skills in the students. **Departmental lab. Teaching:** This is a teaching & learning methodology where students learn handling of laboratory equipment, machines, their practical uses and safety rules. **Skill lab. Teaching:** This is performance based teaching & learning methodology where students learn to physically examine the patients and get hands on training on various clinical skills. **Dissection and demonstration:** Teaching of gross Anatomy is aided by cadaver dissection and demonstration on plastic models. **Assignments and Presentations:** Both of these methodologies are meant to make the students self-directed learners and good communicators by seeking knowledge from multiple sources and presenting it in front of facilitators and peers.
Assessment methodology	**Multiple Choice Questions (MCQs):** **Structured Viva:** **Objective Structured Practical/Clinical Examination (OSPE /VIVA)**

Sr. No	Core contents	Discipline	Learning objectives	Learning Strategy	Assessment methodology
1.	Overview of CNS Functions	Physiology	• Describe the functional components of Nervous system with the help of diagrams. • Describe the major levels of Central Nervous System along with their functions. • Describe the integrative function of Nervous System.	1 LGIS	MCQ
2.	Mobilization and transport of fatty acids	Biochemistry	• Describe mobilization of fatty acids from fat depots • Explain transport of fatty acids to different tissues	1 LGIS	MCQ
3.	Neurons and Neuroglia	Anatomy	• Describe the structure of neuron • Classify the supporting cells and • Enumerate their functions	1 LGIS	MCQ
4.	Nervous System and its Components	Anatomy	• Define the divisions of the nervous system and their components • Enlist the components of each division	1 SGD	MCQ
5.	Structure of Nerve and Concept of Myelinated and Unmyelinated Fibres	Anatomy	• Describe the structure of Nerve • Explain the Myelination of nerve Fibre • Describe the importance of Myelination	1 LGIS	MCQ
6.	Neurodegenerative disorders	Pathology	• Enlist common neurodegenerative disorders • Briefly describe the pathogenesis and C/F of Alzheimer's disease and multiple sclerosis	1 LGIS	MCQ
7.	Oxidation of fatty acids	Biochemistry	• Explain activation and transport of fatty acids in mitochondria • Describe beta oxidation, fate of acetyl-Co A • Understand the regulation of the pathway	1 LGIS	MCQ
8.	Nernst Potential and Na^+ - K^+ Pump	Physiology	• Describe the physiological basis of Nernst potential • Describe the structure and functions of sodium	1 SGD	MCQ

			potassium pump		
9.	Action Potential in a Nerve Fibre	Physiology	• Define Resting Membrane Potential. • Describe the physiological basis of Resting Membrane Potential. • Describe the different phases of action potential • Describe the role of different ion channels in action potential. • Outline the features of propagation of action potential	1 LGIS	MCQ
10.	Synapse-1	Physiology	• Describe physiological anatomy of synapse • Explain pre and post synaptic neurons	1 LGIS	MCQ
11.	Nerve and Ganglion	Histology	• Describe the histological features of nerve tissue with the help of drawings on board in the skill lab • Identify the type of nerve tissue on given slides under microscope. • List two points of identification • Draw a labelled diagram of the identified structures with the help of eosin and hematoxylin pencils on the histology notebooks • Describe the histological changes in nerve in injury, neuroma and regeneration	Skill Lab	OSPE/VIVA
12.	Synapse II	Physiology	• Describe the excitation and inhibition phenomenon • Understand neurotransmitters • Explain pre and post synaptic excitation and inhibition	1 LGIS	MCQ
13.	Triglycerol synthesis and regulation	Biochemistry	• Describe the formation of tri-glycerol • Describe the factors regulating its formation • Discuss different health issues related to tri-glycerol	1 LGIS	MCQ

			metabolism		
14.	Estimation of triglycerides	Biochemistry	• Estimate the triglycerides in the given sample	Skill Lab	VIVQ/OSPE
15.	Rabies	Community Medicine	• Define rabies • Public health importance of rabies • Differentiate between street virus and fixed virus • Discuss epidemiology of rabies • Discuss preventive measures against rabies • Understand pre-exposure prophylaxis • Know post exposure treatment of persons who have been vaccinated for rabies	1 LGIS	MCQ
16.	Sensory Receptors I	Anatomy	• Classify anatomical type of receptors according to ➢ Structure ➢ Location ➢ Modality ➢ adaptability • Describe the anatomical structure of each type of sensory receptor relating it to the function	1 LGIS	MCQ
17.	Sensory Receptors II	Anatomy	• Describe the anatomical structure of neuromuscular spindles • Differentiate between the anatomical structure of annulo-spiral and flower spray endings	1 LGIS	MCQ
18.	Sensory System	Physiology	• Understand the term receptor and transducer, and be able to explain how sensory information from the outside the body is transduced into action potentials. • List and explain the parameters of a sensory modality. • List the types of sensory signals the body receive. • Describe the five general	1 LGIS	MCQ

			types of receptors used to receive these sensory signals. • Explain how the central nervous system determines sensory modality and signal magnitude. • Explain what is meant by receptor adaptation.		
19.	Structure of Spinal Cord-I	Anatomy	• 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 ➢ Lateral grey column • Correlate each nucleus with its function • Describe the structure of white matter in spinal cord. • Explain the rout 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 cords	1 LGIS	MCQ
20.	Structure of Spinal Cord-II	Anatomy	• Demonstrate the structure of spinal cord on a given model. • Explain why arrangement of gray and white matter is different at thoracic and upper lumbar region. • Explain the arrangement of ascending and descending tract at mid cervical level. • Explain the component of a reflex arc. • Correlate the role of reflex arc in maintaining the muscle tone	1 SGD	MCQ

21.	**PBL: Sensory loss**				
22.	Characteristics of Transmission and Processing in Neuronal Pool	Physiology	• Explain the concepts of signal relaying, convergence, Divergence, synaptic inhibition, summation, • Describe the reverbatory (Oscillatory) circuit. • Describe the instability and stability of neuronal circuits	1 LGIS	MCQ
23.	Somatosensory Cortex	Physiology	• Describe the functions of Somatosensory cortex	1 LGIS	MCQ
24.	Synthesis, degradation of Phospholipids	Biochemistry	• Describe the process of synthesis and degradation of phospholipids • Discuss their metabolic disorders	1 LGIS	MCQ
25.	Histology of Spinal Cord	Anatomy	• Identify the microscopic features of spinal cord on a given slide. • List two points of identification for each slide • Draw a labelled diagram of the identified tissue on the histology note book with the help of H&E pencils.	Skill Lab	OSPE/VIVA
26.	Pain Physiology-I	Physiology	• Describe the location and functions of nociceptors • Enlist Causes of Pain • Describe pain control theory • Describe the types of pain	1 LGIS	MCQ
27.	Development of Spinal Cord	Anatomy	• Describe the development of neural tube. • Describe the differentiation of neural tube into different parts of brain. • Describe the development of spinal cord. • Describe the positional changes of the cord	1 LGIS	MCQ
28.	Developmental anomalies of neural tube	Pediatrics	• Enumerate the developmental anomalies of neural tube • Enumerate the causes • Comment on the clinical results of major and minor neural tube anomalies	1 LGIS	MCQ

29.	Pain Physiology-II	Physiology	• Describe the pathways of fast and slow pain • Describe the mechanism of perception of various types of pain.	1 LGIS	MCQ
30.	Ketogenesis	Biochemistry	• Describe mechanism and utilization of ketone bodies and their significance • Understand the term ketogenesis and its mechanism	1 LGIS	MCQ
31.	Biosynthesis of fatty acids	Biochemistry	• Describe synthesis of fatty acids, saturated and unsaturated • Explain the regulation of the pathway	1 LGIS	MCQ
32.	Mental Health	Community Medicine	• Define mental health • Describe characteristics of mentally healthy person • Comment on the warning signals of poor mental health • Enlist types of mental illnesses • Explain causes of mental illness	1 LGIS	MCQ
33.	Ascending Tracts of Spinal Cord	Anatomy	• Explain the pathways for Discriminative touch, light touch, pressure and muscle joint sensations • Describe the effects of lesions of Complete transection of the cord centre of the cord	1 LGIS	MCQ
34.	Sensory Pathways	Physiology	• Show understanding of the functional characteristics of dorsal column and anterolateral pathways • Abnormalities of pain and somatic sensations	1 LGIS	MCQ
35.	**PBL: Spinal injury**				
36.	Developmental Anomalies of Spinal Cord	Anatomy	• 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	1 LGIS	MCQ

			defects		
37.	Physiology of Thermal Sensations	Physiology	• Enlist the location of thermal receptors • Describe the mechanism of stimulation of thermal receptors	1 LGIS	MCQ
38.	Analgesia System in The Body	Physiology	• Describe the of Analgesia system in body. • Enlist the chemical mediators involved in analgesia system. • Describe Referred pain, visceral pain and Parietal pain	1 SGD	MCQ
39.	Cholesterol synthesis	Biochemistry	• Describe cholesterol synthesis, regulation, function and fate • Explain the role of cholesterol in hyper-cholesterolemia, atherosclerosis	1 LGIS	MCQ
40.	Estimation of Cholesterol	Biochemistry	• Estimate cholesterol in the given sample	Skill Lab	VIVA/OSPE
41.	Descending Tracts of Spinal Cord	Anatomy	• 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	1 LGIS	MCQ
42.	Injuries of Spinal Cord	Anatomy	• 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 lower motor neuron lesions. • Enumerate various syndromes affecting the normal function of spinal	1 SGD	MCQ

			cord. • Correlate the motor and sensory deficits with the affected neuronal pathways at particular level.		
43.	Alcoholism and drug dependence	Community Medicine	• Define drug • Define drug dependence and drug abuse • Understand health hazards of drug abuse • Enumerate drug addiction symptoms • Enumerate drugs producing dependence • Explain preventive measures against alcohol and drug abuse	1 LGIS	MCQ
44.	Spinal trauma	Surgery	• Describe the results of Hemi section of spinal cord at levels: o C4 o T6 o T10	1 LGIS	MCQ
45.	Cranial Cavity	Anatomy	• Describe the boundaries of anterior, middle and posterior cranial fossae. • Describe the bones forming inferior view of skull on the given bone. • Mark the foramina at the base of skull and enumerate the contents of clinically relevant foramina.	Skill Lab	OSPE/VIVA
46.	Plasma lipoprotein metabolism	Biochemistry	• Describe transport, function and importance of VLDL, LDL, HDL and chylomicron • Describe the role of lipoprotein in health and disease	1 LGIS	MCQ
47.	Estimation of CK level	Biochemistry	• Estimate CK level in the given sample	Skill Lab	VIVA/OSPE
48.	Superficial reflexes	Physiology	• Demonstrate the superficial reflexes on a given subject	Skill Lab	VIVA/OSPE
49.	Meninges of Brain-I	Anatomy	Identify the meninges of brain on the given model • Identify the dural reflections with special emphasis on tentorium	1 SGD	MCQ

			cerebelli and falx cerebri. • Identify the features of spaces within meninges • Define Meningitis • Enumerate the structures encountered during lumbar puncture • Co relate the significance of anatomical attachments in relation to meningitis		
50.	Meninges of Brain-II	Anatomy	• Describe the attachments of meninges with the help of dissection/model • Identify the supratentorial and infratentorial compartments of tentorium cerebelli with the help of dissection/model • Describe the extradural and subdural hematoma • Explain the dural origin of headache		
51.	CNS infections (Meningitis)	Microbiology	• Enlist important causative agents of meningitis and their transmission • Interpret CSF parameters consistent with meningitis	1 LGIS	MCQ
52.	Lipid storage disease	Biochemistry	• Enlist different lipid storage diseases • Describe the biochemical basis of these disorders	1 LGIS	MCQ
53.	Venous Sinuses of Brain	Anatomy	• 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 facial vein with the occlusion of venous sinuses • Correlate the absence of venous valves in dural venous sinuses to the metastasis of tumor cells.	1 SGD	MCQ
54.	Autoregulation of Cerebral Blood Flow	Physiology	• Describe the auto regulation of cerebral blood flow that protects the brain from changes in arterial pressure	1 LGIS	MCQ

			• Describe the effect of carbon dioxide, hydrogen ions and oxygen on cerebral blood flow		
55.	Regulation of Cerebro Spinal Fluid System	Physiology	• Describe the formation and absorption of CSF	1 LGIS	MCQ
56.	Gross Anatomy of ANS-1	Anatomy	• Describe the autonomic nervous system • Enlist the differences between sympathetic and parasympathetic system	1 LGIS	MCQ
57.	Glycolipid metabolism	Biochemistry	• Describe the pathways for synthesis and degradation of glycolipids • Describe abnormalities commonly seen in glycolipid metabolism	1 LGIS	MCQ
58.	Cerebrovascular accidents	Medicine	• Define Cerebrovascular accidents • Comment on the causes • Give a clinical picture of a patient who has had a bleed in the internal capsule on one side	1 LGIS	MCQ
59.	Gross Anatomy of ANS-2	Anatomy	• Describe the location of ganglia, preganglionic and post ganglionic Fibres of sympathetic nervous system • Describe the location of ganglia, preganglionic and post ganglionic Fibres of parasympathetic nervous system with the help of diagrams	1 LGIS	MCQ
60.	Gross Anatomy of ANS-3	Anatomy	• Describe the activation of sympathetic and parasympathetic nervous system by giving examples • Describe the formation of spinal nerve and distribution of ventral and dorsal rami	1 LGIS	MCQ
61.	Eicosanoids metabolism	Biochemistry	• Describe eicosanoids synthesis, functions and mechanism of action • Describe their role in health and disease	1 LGIS	MCQ

62.	Function of ANS – I	Physiology	• Outline the functions of autonomic nervous system • Describe the functions of sympathetic system	1 LGIS	MCQ
63.	Function of ANS – II	Physiology	• Describe the functions of parasympathetic system	1 LGIS	MCQ
64.	Integration of metabolism I	Biochemistry	• Describe the integration of metabolic pathways (K)	1 LGIS	MCQ
65.	Integration of metabolism II	Biochemistry	• Describe the integration of metabolic pathways	1 LGIS	MCQ
66.	Introduction to Cholinergics	Pharmacology	• Enumerate location of muscarinic receptors and molecular mechanism of their activation • Classify cholinomimetics • Describe the pharmacological effects produced by the activation of these receptors • Describe the adverse effects of cholinomimetics	1 LGIS	MCQ
67.	Introduction to Brain Stem	Anatomy	• 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	1 1 SGD	MCQ
68.	Functions of Brain Stem	Physiology	• Describe the functions of brain stem	1 LGIS	MCQ
69.	Development of Brain Stem	Anatomy	• Describe the development of medulla, pons midbrain and cerebellum • Describe the developmental changes in alar and basal plates in brainstem • Enlist the anomalies associated with it	1 LGIS	MCQ
70.	Structure of Medulla	Anatomy	• Identify the gross features of medulla on a given model. • Explain the gross features of medulla on a given model	1 SGD	MCQ

			• Explain the internal structure of medulla • Correlate the significance of raised pressure in posterior cranial fossa to its effects on medulla oblongata		
71.	Introduction to Anticholin-esterases	Pharmacology	• Classify anticholinesterases • Describe the mechanism of action and adverse effects of anticholinesterases • Enlist their adverse effects	1 LGIS	MCQ
72.	Introduction to Anticholiner-gics	Pharmacology	• Classify anticholinergics • Describe the mechanism of action • Describe the pharmacological actions • Classify sympatho-mimetics according to their receptor selectivity	1 LGIS	MCQ
73.	Structure of Pons	Anatomy	• Identify the gross features of pons on a given model • Explain the internal structure of pons • Discuss the anatomical structures involved in Pontine hemorrhage	1 SGD	MCQ
74.	Cerebral infarcts	Pathology	• Enlist common causes of cerebral infarcts • Explain the morphology and clinical correlation of brain infarction	1 LGIS	MCQ
75.	Stroke	Community Medicine	• Define stroke • Briefly discuss causes of stroke • Enlist host factors in stroke • Explain morbidity and mortality associated with stroke • Define preventive measure against stroke	1 LGIS	MCQ
76.	Blood Supply of Spinal Cord and Brain Stem	Anatomy	• Describe the blood supply of different parts of brain stem and spinal cord. • Describe the course and branches of Internal carotid, vertebral and basilar arteries	1 LGIS	MCQ
77.	Structure of Mid Bain	Anatomy	• Identify the gross structure of midbrain on a given model.	1 SGD	MCQ

			• Describe the internal structure of midbrain • Predict the clinical consequences of trauma to midbrain • Discuss the involvement of nuclei of midbrain with the blockage of cerebral aqueduct		
78.	Sympatho-mimetics	Pharmacology	• Classify Sympatho-mimetics according to their receptor connectivity • Describe the pharmacological effects produced by direct and indirect acting Sympatho-mimetics • Enlist of adverse effect of Sympatho-mimetics	1 LGIS	MCQ
79.	Histology of Brain Stem	Anatomy	• Identify the Microscopic structure of Medulla pons and Midbrain under microscope • Draw labelled diagram of the tissue on sketch copies with the H&E pencils • Give two points of identification for each slide	Skill Lab	OSPE/VIVA
80.	Organization of Cranial Nerve Nuclei	Anatomy	• Describe the motor and sensory nuclei of the cranial nerves • Describe different components of the cranial nerves and their functions	1 1 SGD	MCQ
81.	Muscle Sensory Receptors-1	Physiology	• Describe the receptor functions of muscle spindle. • Describe the dynamic and static response of muscle spindle. • Describe muscle stretch reflex. • Describe the role of muscle spindle in control of voluntary muscle activity. • Describe • Golgi tendon reflex.	1 LGIS	MCQ
82.	Clinical examination sensory system	Physiology	• Demonstrate clinical examination of sensory system	Skill lab	OSPE/VIVA

83.	Muscle Sensory Receptors-2	Physiology	• Describe the role of muscle spindle in control of voluntary muscle activity. • Describe Golgi tendon reflex.	1 LGIS	MCQ
84.	Motor Cortex	Physiology	• Describe the functions of primary motor cortex, premotor area and supplementary motor area • Describe the functions of motor speech are and Brodmann's area- 8	1 LGIS	MCQ
85.	Clinical examination of motor system	Physiology	• Demonstrate clinical examination motor system	Skill lab	OSPE/VIVA
86.	Reflexes	Physiology	• Describe components of different reflex arcs • Understand the role of interneurons in reflex arc	1 LGIS	MCQ
87.	Deep Reflexes	Physiology	• Demonstrate the deep tendon reflexes on a given subject • Demonstrate how these reflexes differ in Upper and Lower motor neuron disorders	Skill Lab	OSPE/VIVA
88.	Introduction to Alpha Blockers	Pharmacology	• Classify alpha adrenergic blockers • Describe the mechanism of action pharmacological effects and adverse effects of Phenoxybenzamine, proazocine, Phentolamine	1 LGIS	MCQ
89.	Vestibular Apparatus-1	Physiology	• Describe the functions of utricle and saccule in maintenance of equilibrium	1 LGIS	MCQ
90.	Vestibular Apparatus-2	Physiology	• Explain the role of semi-circular canals in detecting head rotation	1 LGIS	MCQ
91.	Cerebellum	Anatomy	• Explain the features of lobes of cerebellum on the given model • Explain the gross anatomical features of cerebellar cortex • Explain the cerebellar afferent Fibres and efferent Fibres	1 SGD	MCQ

			• Discuss the anatomical lesions within the parts of cerebellum with disturbance of voluntary movements		
92.	Histology of Cerebellum	Anatomy	• Identify the microscopic features of cerebellum on a given slide. • List two points of identification for each slide • Draw a labelled diagram of the identified tissue on the histology note book with the help of H&E pencils	Skill Lab	OSPE/VIVA
93.	Introduction to Beta blockers	Pharmacology	• Classify beta adrenergic blockers • Describe the mechanism of action of beta adrenergic blockers • Describe the pharmacological effects of beta-adrenergic blockers • Describe the adverse effects of beta blockers	1 LGIS	MCQ
94.	Posture and Balance	Physiology	• Describe the postural reflexes • Explain how body maintain posture	1 LGIS	MCQ
95.	Functions of Cerebellum-I	Physiology	• Describe the motor functions of cerebellum. • Describe the neural circuits of the cerebellum.	1 LGIS	MCQ
96.	Functions of Cerebellum-II	Physiology	• Enlist the functions of vestibulo-cerebellum • Enlist the functions of spino- cerebellum. • Enlist the function of cerebro-cerebellum.	1 LGIS	MCQ
PBL: Cerebellar ataxia					
97.			•		
98.	Basal Ganglia	Anatomy	• 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.	1 LGIS	MCQ

			• Explain the relationships of the different basal nuclei. • Enumerate the connections of various basal nuclei. • Define Hyperkinetic and hypokinetic disorders • Correlate the neuronal degeneration with the development of parkinsonism.		
99.	Functions of Basal Ganglia	Physiology	• Describe the functions of basal ganglia in executing patterns of motor activity (the putamen circuit) • Describe the role of basal ganglia for cognitive control of sequences of motor patterns (the caudate circuits) • Describe the role of basal ganglia to change the timing and scale the intensity of movements	1 LGIS	MCQ
100.	Cerebral cortex	Physiology	• Describe the organisation of cerebral cortex • Relations of cerebral cortex and other high brain centres	1 LGIS	MCQ
101.	Diencephalon	Anatomy	• Describe gross features of parts of diencephalon. • Thalamus • hypothalamus • Correlate the anatomical lesions of nuclei of thalamus and hypothalamus with the clinical conditions like diabetes insipidus and obesity	1 LGIS	MCQ
102.	Gross Features of Cerebral Hemisphere	Anatomy	• Describe the gross features of 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	1 SGD	MCQ
103.	Cerebrum	Anatomy	• Identify the histological features of cerebrum under	Skill Lab	OSPE/VIVA

			microscope. • Draw a labelled diagram of cerebrum in practical notebook. • List two points of identification		
104.	Gross Anatomy of White Matter of Cerebrum	Anatomy	• Classify the cerebral Fibres of according to their connections. • Describe the features of Commisural fibres • Association Fibres • Projection Fibre • Explain the effects of lesions of different parts of internal capsule	1 1 SGD	MCQ
105.	Areas of brain	Anatomy	Identify the location of major sensory and motor areas within specific lobes with the help of dissection	2 1 SGD	MCQ
106.	Functions of cerebral Cortex	Physiology	• Describe the functions of primary cortex • Describe the functions of parieto-occipito temporal area, prefrontal association area, limbic association area	1 LGIS	MCQ
107.	Lesions of Cerebral Cortex	Anatomy	• Discuss lesions in the Motor cortex with the disturbance in articulation • Discuss lesions in the Frontal eye field with the personality disorders	1 SGD	MCQ
108.	Genetics, Anatomy and Biochemistry of Behaviour	Behavioural Sciences	• Describe family, twin and adoption studies • Discuss brain and behaviour relationship • Describe the role of central and peripheral nervous system in behaviour • Discuss the role of important neurotransmitters in behaviour	1 LGIS	MCQ
109.	Blood Supply of Cerebrum	Anatomy	• Describe the blood supply of different parts of cerebrum. • Explain the formation and importance of veins draining cerebrum • Explain the formation of	1 SGD	MCQ

			circle of Willis • Explain the features of anterior cerebral artery occlusion • Middle cerebral artery occlusion • Posterior cerebral artery occlusion		
110.	Ventricles of Brain-1	Anatomy	• Enumerate ventricles of brain • Describe the relations and boundaries of each ventricle • Describe the formation of choroid plexus	1 LGIS	MCQ
111.	Ventricles of Brain-2	Anatomy	• Explain the process of production and absorption of CSF by arachnoid villi • Explain the causes of overproduction and blockage of CSF • Explain the varieties of hydrocephalus	1 LGIS	MCQ
112.	Imaging of CNS	Anatomy	• Describe the appearance of different parts of brain in ➢ Radiographs ➢ MRI ➢ CT	1 LGIS	MCQ
113.	Development of Cerebrum	Anatomy	• Describe the development of cerebral hemispheres and ventricles. • Explain the relation of congenital aqueduct stenosis and hydrocephalus. • Explain the congenital anomalies associated with development of cerebrum.	1 LGIS	MCQ
114.	Hydrocephalus and intracranial bleed	Pathology	• Define hydrocephalus • Explain briefly the clinical features of hydrocephalus • Enlist common causes and clinical correlations of intracranial bleed	1 LGIS	MCQ
115.	Hydrocephalus	Pediatrics	• Define hydrocephalus • Enumerate its causes • Comment on the methods used to diagnose this condition • Describe its clinical effects in children	1 LGIS	MCQ

116.	Memory and Perception	Behavioural Sciences	• Describe the concept of memory • Explain the process of memory • Describe types of memory • Enlist different problems of memory • Know about memory strategies to improve memory • Differentiate between sensation and perception • Describe different types of perceptions • Enlist disorders of perception	1 LGIS	MCQ
117.	Memory	Physiology	• Describe the roles of synaptic facilitation and synaptic inhibition in consolidation of memory.	1 LGIS	MCQ
118.	Memory	Physiology	• Describe the role of specific brain parts in memory process.	1 LGIS	MCQ
119.	Olfactory and Optic Nerve	Anatomy	• 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 • 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.	1 SGD	MCQ
120.	Development of Skull	Anatomy	• Describe the stages of development of Neurocranium • Describe the stages of	1 LGIS	MCQ

			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 ➢ changes in intracranial pressure ➢ labour. • Describe the features of newborn Cranium		
121.	Limbic System and RAS	Anatomy	• 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	1 LGIS	MCQ
122.	Limbic System and Hypothalamus	Physiology	• Describe the functions of limbic system. • Describe the vegetative endocrine control functions of hypothalamus. • Describe the behavioral control functions of the hypothalamus and associated limbic structure.	1 LGIS	MCQ
123.	Estimation of body temperature	Physiology	• Demonstrate how to measure temperature by various routes. • Explain the components of temperature regulation in human along with control system • Explain the causes of	Skill lab	OSPE/VIVA

			hyperthermia and hypothermia and normal temperature		
124.	Limbic System and Hypothalamus	Physiology	• Describe the reward and punishment of limbic system. • Describe the specific functions of hippocampus, amygdala, limbic cortex.	1 LGIS	MCQ
125.	Oculomotor, Trochlear and Abducent Nerve	Anatomy	• Enumerate the nuclei of oculomotor, trochlear and abducent nerve. • Trace the course of these nerves to their target organ.	1 SGD	MCQ
126.	5th, 7th and 8th Nerve	Anatomy	• Enumerate the nuclei of 5th, 7th and 8th nerves. • Describe the intracranial course of each nerve.	1 SGD	MCQ
127.	**PBL: Facial palsy**				
128.	9th 10th 11th and 12th Nerve	Anatomy	• Enumerate the nuclei of 9th, 10th 11th and 12th cranial nerves. • Describe the intracranial course of each nerve.	1 SGD	MCQ
129.	Clinical examination cranial nerves	Physiology	• Demonstrate clinical examination of all cranial nerves	Skill lab	OSPE/VIVA
130.	Sleep	Physiology	• Define sleep. • Describe slow wave sleep, REM sleep. • Describe the neuronal centers, neurohormonal substances and mechanism that cause sleep. • Describe the brain waves.	1 LGIS	MCQ
131.	EEG	Physiology	• Demonstrate understanding of the origin of brainwaves • Describe the relationship between cerebral activity and EEG • Demonstrate understanding of the abnormal EEG patterns	1 LGIS	MCQ

Learning Resources:

Anatomy

Text Books

1. Regional Anatomy by Snell
2. Embryology by Langman's
3. Snell's Neuro Anatomy
4. Histology by Janquira
5. General Anatomy by Laique Hussain

Reference Books:

6. Clinical Anatomy by Keith L. Moore
7. Histology by Laique Hussain
8. Histology by Difiore
9. Student Gray's
10. Embryology by Keith L. Moore

Physiology

11. Text Book of Medical Physiology by Guyton & Hall
12. Physiology by Lippincott

Biochemistry

13. Lippincott Biochemistry.
14. Harper's Biochemistry
15. Mushtaq's Biochemistry

Pathology

16. Pathologic Basis of Disease by Robbins and Cotran.

Pharmacology

17. Lippincott pharmacology.
18. Katzung Pharmacology. Biochemistry

Behavioural Sciences

19. Introduction to Psychology by Edward. E Smith.
20. Behavioural Science by Lippincott Williams.

Community Medicine

21. Text book of Preventive and Social Medicine by JE. Park

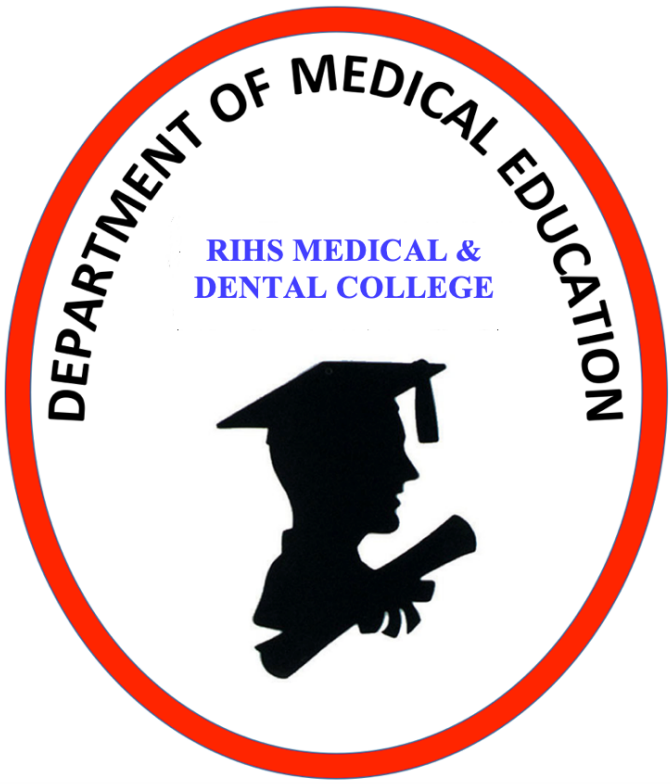
Medicine

22. Davidson's Text book of Medicine

Surgery

23. Text book of Surgery by Bailey & Love

24. Text book of Radiology by Christson



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