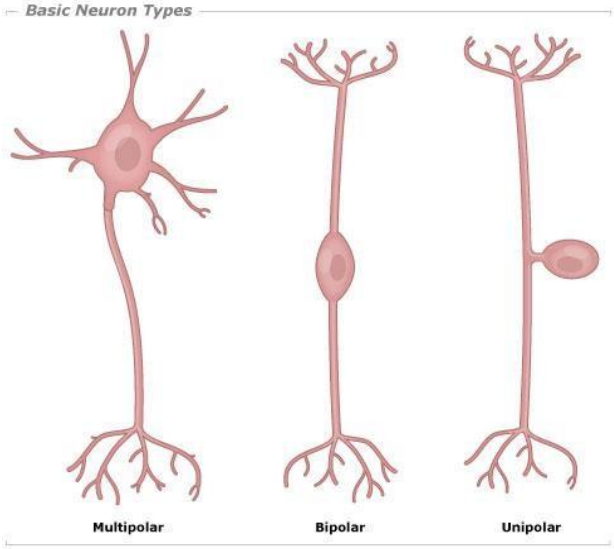
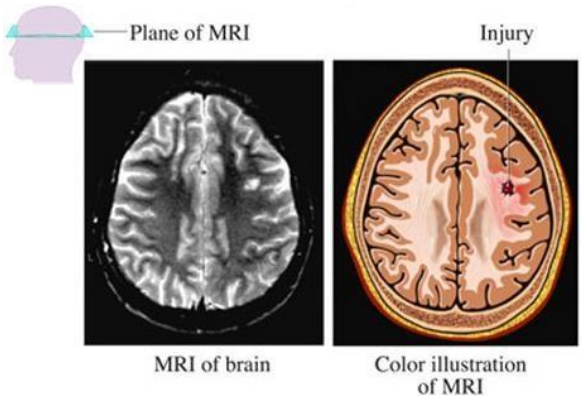
# STUDY GUIDE

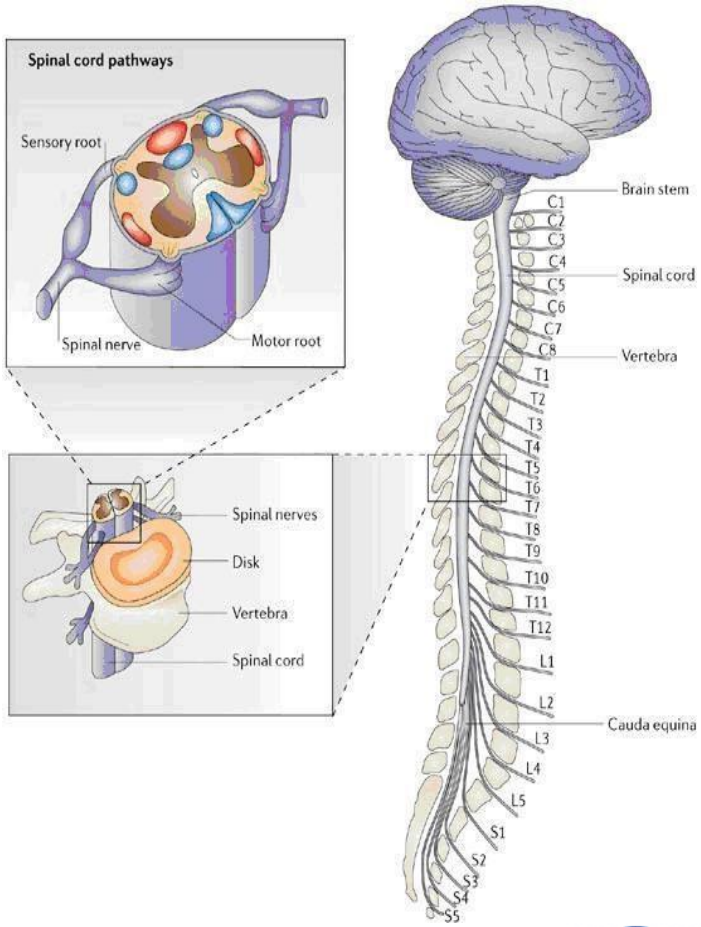
## NEUROSCIENCES-I MODULE

## SECOND YEAR MBBS

**3rd Feb – 20th March 2020**
**Duration: 6 weeks**




**LIAQUAT NATIONAL HOSPITAL AND MEDICAL COLLEGE**
Institute for Postgraduate Medical Studies & Health Science

# STUDY GUIDE FOR NEUROSCIENCES-I MODULE

*Module name:* ***Neurosciences-I*** *Year:* ***Two*** *Duration:* ***6 weeks (Feb – March 2020)***

*Timetable hours:* **Interactive Lectures, Case-Based Learning (CBL), Self-Study, Practical, Skills, Demonstrations, Visit to Wards & Laboratory**

## MODULE INTEGRATED COMMITTEE

| | |
|---|---|
| ***MODULE COORDINATOR:*** | • Dr. Kashif Nisar (Biochemistry) |
| ***CO-COORDINATORS:*** | • Dr. Fizzah Ali (Pharmacology) |

### DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING

**BASIC HEALTH SCIENCES**

***ANATOMY***
Professor Zia-ul-Islam

***BIOCHEMISTRY***
Dr. Kashif Nisar

***COMMUNITY MEDICINE***
Dr. Saima Zainab

***PHYSIOLOGY***
Professor Syed Hafeezul Hassan

***DEPARTMENT OF HEALTH PROFESSIONS EDUCATION***

- Professor Nighat Huda
- Dr. Afifa Tabassum
- Dr. Sobia Ali
- Dr. M. Suleman Sadiq
- Dr. Mehnaz Umair

***LNH&MC MANAGEMENT***

- Professor KU Makki, Principal LNH&MC
- Dr. Shaheena Akbani, Director A.A & R.T LNH&MC

***STUDY GUIDE COMPILED BY: Department of Health Professions Education***

## INTRODUCTION

### WHAT IS A STUDY GUIDE?

It is an aid to:

- Inform students how student learning program of the semester-wise module has been organized
- Help students organize and manage their studies throughout the module
- Guide students on assessment methods, rules and regulations

### THE STUDY GUIDE:

- Communicates information on organization and management of the module.
  This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstration, tutorial and case based learning that will be implemented to achieve the module objectives.
- Provides a list of learning resources such as books, computer assisted learning programs, web- links, journals, for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous and semester examinations on the student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's achievement of objectives.
- Focuses on information pertaining to examination policy, rules and regulations.

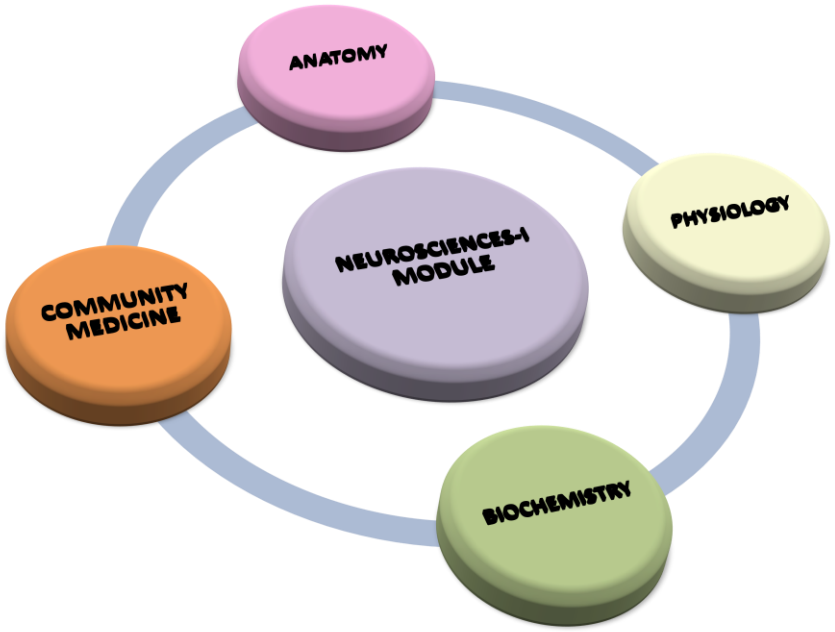
### CURRICULUM FRAMEWORK

Students will experience *integrated curriculum* similar to previous modules**.**

**INTEGRATED CURRICULUM** comprises of system-based modules such as Head and Neck, Neurosciences-I, Special Senses and Endocrinology-I which links basic science knowledge to clinical problems. Integrated teaching means that subjects are presented as a meaningful whole. Students will be able to have better understanding of basic sciences when they repeatedly learn in relation to clinical examples.

Case-based discussions, computer-based assignments, early exposure to clinics, wards, and skills acquisition in skills lab are characteristics of integrated teaching program.

# INTEGRATING DISCIPLINES OF NEUROSCIENCES I MODULE




## LEARNING METHODOLOGIES

The following teaching / learning methods are used to promote better understanding:

- Interactive Lectures
- Hospital / Clinic visits
- Small Group Discussion
- Case- Based Learning
- Practicals
- Skills session
- Self Study

### INTERACTIVE LECTURES

In large group, the lecturer introduces a topic or common clinical conditions and explains the underlying phenomena through questions, pictures, videos of patients' interviews, exercises, etc. Students are actively involved in the learning process.

**HOSPITAL VISITS:** In small groups, students observe patients with signs and symptoms in hospital or clinical settings. This helps students to relate knowledge of basic and clinical sciences of the relevant module.

**SMALL GROUP DISCUSSION (SMALL GROUP DISCUSSIONS):** This format helps students to clarify concepts acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient case, interviews or discussion topics. Students exchange opinions and apply knowledge gained from lectures, tutorials and self study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

**CASE- BASED LEARNING:** A small group discussion format where learning is focused around a series of questions based on a clinical scenario. Students' discuss and answer the questions applying relevant knowledge gained in clinical and basic health sciences during the module.

**PRACTICAL:** Basic science practicals related to anatomy, biochemistry, pathology, pharmacology and physiology are scheduled for student learning.

**SKILLS SESSION:** Skills relevant to respective module are observed and practiced where applicable in skills laboratory or Department of Physiotherapy.

**SELF STUDY:** Students' assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Center, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

## MODULE 2 : NEUROSCIENCES-I

### INTRODUCTION

Neuroscience is the study of the nervous system. It is a cross-disciplinary field that engages in investigating how the nervous system develops and functions on a cellular level as well as the mechanisms that underlie neurological disease. This module combines breadth of exposure to the field as a whole with the opportunity for depth of experience in one of three central domains of neuroscience: Cellular and Systems, Functional and Integration and Clinical Neurosciences.

When someone in the neighborhood develops stroke and the family wants to know what more can be done to improve the patient's lifestyle, or what are the chances his /her children will have stroke, it is our primary responsibility as future doctors to know not just the treatment but also preventive strategies for a healthy living.

Through this module you will develop an integrated, scientific knowledge that you can put into practice in a clinical setting, plus creative and problem-solving skills. These key skills will prepare you for a career helping to progress scientific discovery into clinical and medical practice, ultimately to improve human health.

| Common Neurological Diseases & Disorders |
|---|
| Epilepsy |
| Alzheimer and other dementias |
| Parkinson's disease |
| Multiple sclerosis |
| Migraine |
| Cerebrovascular disease |
| Poliomyelitis |
| Tetanus |
| Meningitis |
| Japanese encephalitis |
| Nutritional deficiencies and neuropathies |
| Neurological injuries |

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**COURSE OBJECTIVES AND STRATEGIES**

At the end of the module the students will be able to:

## ANATOMY

| *OBJECTIVES* | *TEACHING STRATEGY* |
|---|---|
| 1. Describe the development of forebrain, mid brain and hind brain and the spinal cord.<br>2. Enumerate the congenital anomalies of brain and spinal cord | Interactive Lecture |
| 3. Correlate the development of ventricles and meninges with associated congenital anomalies<br>4. Discuss the development of peripheral and autonomic nerves | |
| 5. Describe the bony features of Skull as whole, vault of skull and cranial cavity ( anterior , middle & posterior cranial fossae) | Small Group Discussion |
| 6. Discuss the general organization of nervous system<br>7. Explain structure and functions of different types of neurons and neuroglial cells | Interactive Lecture |
| 8. Describe the microscopic features of nervous tissue, sensory receptors, ganglion, myelin sheath and blood brain barrier<br>9. Explain cross sectional appearance of a nerve | Practicals / Skills session |
| 10.Describe the Gross and microscopic features of meninges of the brain and spinal cord | LGD / Small Group Discussion |
| 11. Discuss the gross anatomy and cross sections of spinal cords at different levels with its neurovascular supply + histology of spinal cord | Interactive Lecture |
| 12. Discuss clinical importance of the ascending and descending tracts<br>13. Describe the formation of spinal nerves and nerve plexuses | Interactive lecture / Small Group Discussion |
| 14. Discuss the clinical importance of brain stem (medulla, pons and midbrain) in relation to their structure and vascular supply<br>15. Discuss the clinical conditions associated with medulla oblongata | |
| 16. Discuss the organization of Autonomic Nervous system (ANS) | Interactive Lecture |
| 17. Discuss the external and internal structures of cerebellum and associated fibers.<br>18. Discuss the clinical conditions associated with cerebellar dysfunction | |
| 19. Describe the gross features of diencephalon ( thalamus, hypo- thalamus and epithalamus including pineal gland and their respective nuclei)<br>20. Discuss the lesions of subthalamus, hypothalamus & epithalamus<br>21. Discuss the clinical conditions associated with thalamus | Interactive lecture /Case-Based Discussion |

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|---|---|
| 22. Describe the cerebral hemisphere with surfaces, lobes, sulci and gyri<br>23. Explain the different cortical areas of brain with their functions and lesions | Interactive Lecture / SGD |
| 24. Describe the histological features of the cerebral and cerebellar cortex with different nerve cell types in cortex | Practicals / Skills session |
| 25. Describe the white matter of cerebral hemisphere (commissural, association and projection fibers)<br>26. Describe the internal capsule including its fibers in different parts and blood supply | Small Group Discussion |
| 27. Describe the basal nuclei of brain<br>28. Explain the major components of the limbic system & reticular formation<br>29. Discuss the microscopic features of substantia nigra<br>30. Discuss the lesions of basal ganglia & its nuclei | Interactive Lecture / Small group discussion |
| 31. Discuss the ventricular system of brain and circulation of cerebrospinal fluid (CSF)<br>32. Discuss the applied anatomy of ventricles and CSF flow | |
| 33. Correlate the blood supply of the brain and spinal cord with their clinical significance in relation to ischemia or hemorrhage<br>34. Describe the arterial circle of Willis with its clinical importance | Interactive lecture /Team-Based Learning |
| 35. Discuss dural venous sinuses along with their clinical importance | Interactive lecture |
| 36. Describe the autonomic nervous system<br>37. Discuss the division of ANS into sympathetic & parasympathetic nervous system<br>38. Discuss the components of sympathetic part of nervous system (thoracolumbar outflow: lateral gray horn, paravertebral sympathetic chain, prevertebral ganglia and plexuses<br>39. Discuss the components of parasympathetic part of nervous system ( craniosacral outflow: parasympathetic cranial nerve nuclei and sacral spinal segments) | Interactive Lecture |
| 40. Explain the cranial nerve Nuclie.<br>41. Discuss the intra and extracranial course and lesions of Cranial nerves 3, 4, 5, 6 .<br>42. Discuss the intra and extracranial course and lesions of Cranial nerves 7, 9, 10, 11, 12 . | Interactive lecture / Case-based Discussion |
| 43. Discuss the Radiological Anatomy of brain and spinal cord | Small Group discussion |

# BIOCHEMISTRY

| *OBJECTIVES* | *TEACHING STRATEGY* |
|---|---|
| **Lipids of Nervous System** | |
| 1. Explain the chemistry of Brain Lipids (Glycolipids) | Interactive Lecture |
| **Blood Brain Barrier** | |
| 2. Explain the biochemical composition and functions of the blood brain barrier | Interactive Lecture |
| **CSF** | |
| 3. Describe the chemical composition of CSF in relation to the different diseased states | Interactive Lecture |
| **Neurotransmitters** | |
| 4. Classify the neurotransmitters, their mechanism of action and functions<br>5. Explain the neurochemical role of Acetylcholine & Dopamine and their related disorders<br>6. Describe the neurochemical functions of Serotonin and GABA and their related disorders | Interactive Lecture |
| **Free Radicals** | |
| 7. Describe the role of free radicals in degenerative diseases of CNS | Interactive Lecture |
| **Vitamin B1 & B6** | |
| 8. Discuss the biochemical importance of vitamin B1 & B6 in neurological disorders | Interactive Lecture |
| 9. Explain the process of Lumber Puncture for taking sample of CSF | Demonstration |
| 10. Estimate glucose in CSF | Practical |
| 11. Estimate proteins in CSF | |
| 12. Estimate chloride in CSF | |

# PHYSIOLOGY

| *OBJECTIVES* | *TEACHING STRATEGY* |
|---|---|
| **Neurons Membrane, Generation & Propagation of Nerve Impulse** | |
| 1. Elaborate the structure and functions of neuron<br>2. Discuss the classification & functions of nerve fibers<br>3. Describe the threshold & initiation of action potential in neuronal cells<br>4. Describe the propagation of nerve impulse/ saltatory conduction | Interactive Lecture / Small Group Discussion |
| **Synapsis, Properties of Synapses** | |
| 5. Describe the properties of chemical and electrical synapses | Interactive Lecture / Small Group Discussion |
| **Sensory Receptors and Neuronal Circuits** | |
| 6. Discuss the classification of sensory receptors<br>7. Describe the functions & properties of different types of receptors<br>8. Explain the properties of different types of neuronal circuit | Interactive Lecture / Small Group Discussion |
| **Somatic Sensations** | |
| 9. Explain the general organization of somatic sensation: tactile and position senses<br>10.Discuss the dorsal-column medial lemniscal pathway<br>11.Discuss the anterolateral –pathway<br>12.Describe the mechanism of thermal receptors and their excitation | Interactive Lecture / Small Group Discussion |
| **Physiology of Pain – I & Headache** | |
| 13.Discuss the types of pain (slow and fast) and their characteristics<br>14.Explain the mechanism of stimulation of pain receptors<br>15.Discuss the clinical abnormalities of pain: hyperalgesia, headache and its causes | Interactive Lecture / Small Group Discussion |
| **Physiology of Pain II- Brain Analgesic System** | |
| 16. Explain the brain analgesic system<br>17. Discuss the brain's opiate system<br>18. Discuss visceral and referred pains | Interactive Lecture / Small Group Discussion |
| **Spinal Cord and Reflexes** | |
| 19. Describe the motor function of spinal cord<br>20. Discuss the mechanism of flexor reflex, crossed extensor reflex, scratch reflex, postural and locomotive reflexes<br>21. Discuss spinal cord transection & spinal shock (Brown Sequard syndrome) | Interactive Lecture / Small Group Discussion |

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| **Muscles Proprioceptors (muscle spinal & Golgi tendon organ)** | |
| 22. Explain the structure and function of muscle spindle<br>23. Discuss the muscle, stretch reflex and its clinical applications<br>24. Explain the mechanism of Golgi tendon reflex and its significance in controlling motor activities. | Interactive Lecture / Small Group Discussion |
| **Somatosensory Cortex** | |
| 25. Discuss the orientation of various areas of cortex and their associated function<br>26. Describe the layers of somatic sensory cortex and their functions | Interactive Lecture / Small Group Discussion |
| **Function of Brain Stem** | |
| 27. Explain the role of brain stem nuclei in controlling motor functions<br>28. Discuss the vital and non- vital functions of brain stem (respiratory, cardiac, vasomotor centers and coughing, sneezing and vomiting reflexes) | Interactive Lecture / Small Group Discussion |
| **Cerebellum and its Functions** | |
| 29. Explain the functions of cerebellum and its associated disorders<br>30. Discuss the afferent and efferent pathways of cerebellum. | Interactive Lecture / Small Group Discussion |
| **Vestibular System and Maintenance of Equilibrium** | |
| 31. Name the parts of vestibular system<br>32. Explain the functions of the vestibular system<br>33. Discuss the role of utricle and saccule in static equilibrium<br>34. Discuss the role of semicircular Ducts in Angular Acceleration | Interactive Lecture / Small Group Discussion |
| **Functions of Diencephalon** | |
| 35. Discuss the function of thalamus and its nuclei. | Interactive Lecture / Small Group Discussion |
| **Limbic System** | |
| 36. Describe the functions of limbic system<br>37. Discuss the role of hypothalamus in Limbic system<br>38. Discuss the importance of reward and punishment centers<br>39. Elaborate the role of hippocampus and amygdale<br>40. Discuss the effects of Kluver – Bucy syndrome | Interactive Lecture / Small Group Discussion |
| **Basal Ganglia and its Nuclei** | |
| 41. Explain the functions of caudate and putamen pathways<br>42. List the functions of specific neurotransmitters of basal ganglial system<br>43. Explain the disorders associated with basal ganglia (hypokinetic and hyperkinetic) | Interactive Lecture / Small Group Discussion |
| **Motor Cortex, Pyramidal Tract, Upper and lower Motor Neurons** | |
| 44. Explain the functions of pyramidal tract<br>45. List the functions of specific cortical areas<br>46. Differentiate between upper and lower motor neuron lesions (UMN and LMN). | Interactive Lecture / Small Group Discussion |

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|---|---|
| **Physiology of Sleep & Sleep Disorders** | |
| 47. Explain the physiology of slow wave sleep and rapid eye movement (REM)sleep<br>48. Explain the basic theories of sleep and origin of brain waves | Interactive Lecture / Small Group Discussion |
| **Learning and Memory** | |
| 49. Determine the role of cerebral cortex in higher intellectual functions<br>50. Classify the different types of memories | Interactive Lecture / Small Group Discussion |
| **CSF: Formation, Circulation & Function** | |
| 51. Describe the mechanism of CSF formation, circulation and function | Interactive Lecture / Small Group Discussion |
| **Autonomic Nervous System** | |
| 52. Describe the functions of sympathetic and parasympathetic nervous system | Interactive Lecture / Small Group Discussion |
| **Speech &its Disorders** | |
| 53. Explain the physiology of speech and associated disorders | Interactive Lecture / Small Group Discussion |
| **Examination of Superficial reflexes** | |
| 54. To perform superficial reflexes and its significance in different neurological disorders<br>• Corneal reflexes<br>• Abdominal reflexes<br>• Plantar reflexes | Practicals |
| **Examination of Deep reflexes** | |
| 55. Perform superficial deep reflexes and its significance | |
| **Cerebellar function tests** | |
| 56. Perform cerebellar function tests and to identify associated disorders. | |
| **Body temperature** | |
| 57. Determine body temperature by using oral mercury thermometer | |
| **EEG** | |
| 58. Interpret brain waves with the help of power lab | |
| **Examination of Cranial Nerve (V,VII,IX,X)** | |
| 59. Examine the cranial nerves by performing different test | |

## COMMUNITY MEDICINE

| *OBJECTIVES* | *TEACHING STRATEGY* |
|---|---|
| 1. Discuss the Endemic Diseases of CNS | Tutorial |

## LEARNING RESOURCES

| *SUBJECT* | *RESOURCES* |
|---|---|
| **ANATOMY** | **A. GROSS ANATOMY**<br>1. K.L. Moore, Clinically Oriented Anatomy<br>2. Neuro Anatomy by Richard Snell<br>**B. HISTOLOGY**<br>1. B. Young J. W. Health Wheather's Functional Histology<br>**C. EMBRYOLOGY**<br>1. Keith L. Moore. The Developing Human<br>2. Langman's Medical Embryology |
| **BIOCHEMISTRY** | **A. TEXTBOOKS**<br>1. Harper's Illustrated Biochemistry<br>2. Lehninger Principle of Biochemistry<br>3. Biochemistry by Devlin |
| **COMMUNITY MEDICINE** | **A. TEXT BOOKS**<br>1. Community Medicine by Parikh<br>2. Community Medicine by M Illyas<br>3. Basic *Statistics* for the Health Sciences by Jan W Kuzma |
| **PHYSIOLOGY** | **A. TEXTBOOKS**<br>1. Textbook Of Medical Physiology by Guyton And Hall<br>2. Ganong ' S Review of Medical Physiology<br>3. Human Physiology by Lauralee Sherwood<br>4. Berne & Levy Physiology<br>5. Best & Taylor Physiological Basis of Medical Practice<br>**B. REFERENCE BOOKS**<br>1. Guyton & Hall Physiological Review<br>2. Essentials Of Medical Physiology by Jaypee<br>3. Textbook Of Medical Physiology by InduKhurana<br>4. Short Textbook Of Physiology by Mrthur<br>5. NMS Physiology |

## OTHER LEARNING RESOURCES

| | |
|---|---|
| **Weblink** | http://www.who.int/mental_health/neurology/neurological_disorders_report_web.pdf |
| **Hands-on Activities/ Practical** | Students will be involved in Practical sessions and hands-on activities that link with the Nervous system I module to enhance the learning. |
| **Labs** | • Utilize the lab to relate the knowledge to the specimens and models available. |
| **Skill Labs** | • A skills lab provides the simulators to learn the basic skills and procedures. This helps build the confidence to approach the patients. |
| **Videos** | Video familiarize the student with the procedures and protocols to assist patients. |
| **Computer Lab/CDs/DVDs/Internet Resources:** | To increase the knowledge students should utilize the available internet resources and CDs/DVDs. This will be an additional advantage to increase learning. |
| **Self Study** | Self Study which generally means studying without direct supervision. During this session one learns by himself/herself to search for information to solve cases, read through different resources and discuss among the peers and with the faculty to clarify the concepts. |

## ASSESSMENT METHODS:

- **Best Choice Questions(BCQs)** also known as MCQs (Multiple Choice Questions)
- **Objective Structured Practical/Clinical Examination (OSPE or OSCE)**

**BCQs:**

- A BCQ has a statement or clinical scenario of four options (likely answers).
- **Correct answer carries one mark, and incorrect 'zero mark'. There is NO negative marking.**
- Students mark their responses on specified computer-based sheet designed for LNHMC.

**OSCE:**

- All students rotate through the same series of stations in the same allocated time.
- At each station, a brief written statement includes the task. Student completes the given task at one given station in a specified time.
- Stations are observed, unobserved, interactive or rest stations.
- In unobserved stations, flowcharts, models, slide identification, lab reports, case scenarios may be used to cover knowledge component of the content.
- Observed station: Performance of skills /procedures is observed by assessor
- Interactive: Examiner/s ask questions related to the task within the time allocated.
- In Rest station, students in the given time not given any specific task but wait to move to the following station.

**Internal Evaluation**

- Students will be assessed comprehensively through multiple methods.
- 20% marks of internal evaluation will be added to JSMU final exam. That 20% may include class tests, assignment, practicals and the internal exam which will all have specific marks allocation.

**Formative Assessment**

Individual department may hold quiz or short answer questions to help students assess their own learning.

The marks obtained are not included in the internal evaluation

**For JSMU Examination Policy, please consult JSMU website!**

| | | |
|---|---|---|
| | **More than 75% attendance is needed to sit for the internal and final examinations** | |

**LNH&MC EXAMINATION RULES & REGULATIONS**

- Student must report to examination hall/venue, 30 minutes before the exam.
- **Exam will begin sharp at the given time.**
- No student will be allowed to enter the examination hall after 15 minutes of scheduled examination time.
- Students must sit according to their roll numbers mentioned on the seats.
- **Cell phones are strictly not allowed in examination hall.**
- If any student is found with cell phone in any mode (silent, switched off or on) he/she will be not be allowed to continue their exam.
- No students will be allowed to sit in exam without University Admit Card, LNMC College ID Card and Lab Coat
- Student must bring the following stationary items for the exam: Pen, Pencil, Eraser, and Sharpener.
- Indiscipline in the exam hall/venue is not acceptable. Students must not possess any written material or communicate with their fellow students.

## SCHEDULE:

| WEEKS | 2nd YEAR | DATES |
|---|---|---|
| WEEK 1 | HEAD & NECK MODULE | 30th Dec 2019 |
| WEEK 2 | | |
| WEEK 3 | | |
| WEEK 4 | | |
| WEEK 5 | | 31st Jan 2020 |
| WEEK 1 | NEUROSCIENCES-I MODULE | 3rd Feb 2020 |
| WEEK 2 | | |
| WEEK 3 | | |
| WEEK 4 | | |
| WEEK 5 | | |
| WEEK 6 | | 20th March 2020* |
| WEEK 1 | SPECIAL SENSES | March 2020* |
| WEEK 2 | | |
| WEEK 3 | | |
| WEEK 4 | | April 2020* |
| PREPARATORY LEAVE | | |
| MID TERM EXAM | | |

* Final dates will be announced later.