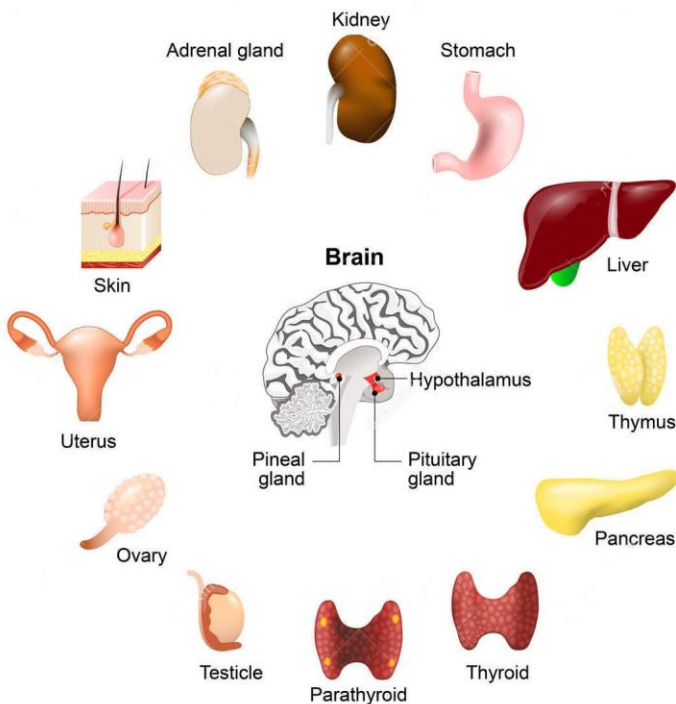


# ENDOCRINE SYSTEM



# STUDY GUIDE

## ENDOCRINE-I MODULE

## SECOND YEAR MBBS

May –June 2020  
Duration: 4 weeks



Forms of Chemical Signaling	
Autocrine	A cell targets itself.
Signaling across gap junctions	A cell targets a cell connected by gap junctions.
Paracrine	A cell targets a nearby cell.
Endocrine	A cell targets a distant cell through the bloodstream.



**STUDY GUIDE FOR ENDOCRINE MODULE**

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Module name: **Endocrine**      Year: **Two**      Duration: **4 weeks (May – June 2020)**

Timetable hours: **Lectures, Case-Based Learning (CBL), Self-Study, Practical, Skills, Demonstrations**

### MODULE INTEGRATED COMMITTEE

<b>MODULE COORDINATOR:</b>	Dr. Shehnaz Sheikh (Biochemistry)
<b>CO-COORDINATORS:</b>	Dr. Aneeta Khoso (Community Medicine)

### DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING

<b>BASIC HEALTH SCIENCES</b>		
<b>ANATOMY</b> Professor Zia-ul-Islam		
<b>BIOCHEMISTRY</b> Dr. Kashif Nisar		
<b>PHYSIOLOGY</b> Professor Syed Hafeezul Hassan		
<b>DEPARTMENT OF HEALTH PROFESSIONS EDUCATION</b>		
<ul style="list-style-type: none"> <li>• Professor Nighat Huda</li> <li>• Dr. M. Suleman Sadiq</li> </ul>	<ul style="list-style-type: none"> <li>• Dr. Sobia Ali</li> <li>• Dr. Mehnaz Umair</li> </ul>	<ul style="list-style-type: none"> <li>• Dr. Afifa Tabassum</li> </ul>
<b>LNH&amp;MC MANAGEMENT</b>		
<ul style="list-style-type: none"> <li>• Professor KU Makki, Principal LNH&amp;MC</li> <li>• Dr. Shaheena Akbani, Director A.A &amp; R.T LNH&amp;MC</li> </ul>		
<b>STUDY GUIDE COMPILED BY: Department of Health Professions Education</b>		

## **INTRODUCTION**

### **WHAT IS A STUDY GUIDE?**

It is an aid to:

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

### **THE STUDY GUIDE:**

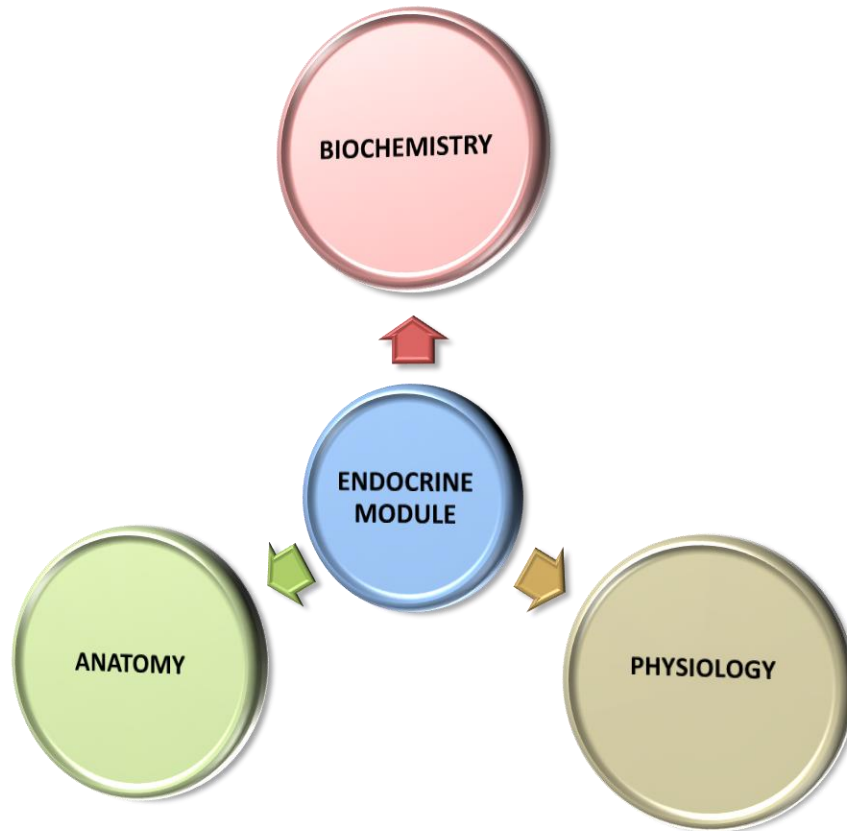
- Communicates information on organization and management of the module.  
This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as lectures, small 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 module 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* in previous module at LNMC in accordance with the JSMU guidelines and most recent developments that have an impact on individual health.

**INTEGRATED CURRICULUM** comprises of system-based modules such as Head and Neck, Neurosciences and Endocrinology 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 and physiotherapy department are characteristics of integrated teaching program.

## INTEGRATING DISCIPLINES OF ENDOCRINE 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.

**Apart from attending daily scheduled sessions, students too should engage in self-study to ensure that all the objectives are covered.**



## MODULE 3 : ENDOCRINE

### INTRODUCTION

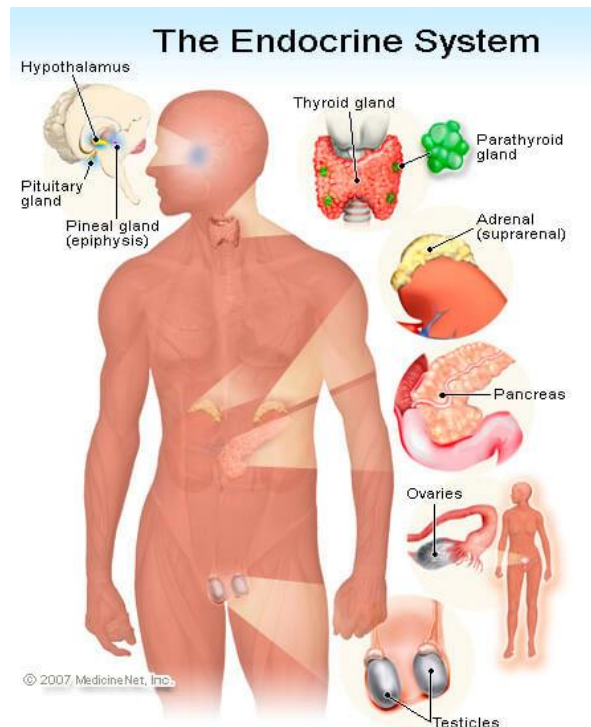
The Endocrine system relays information and maintains a constant internal environment of the body called homeostasis. It acts through chemical messengers called hormones that influence growth, development, and metabolic activities. The action of the endocrine system is measured in minutes, hours, or weeks and is more generalized than the action of the nervous system.

This M.B.B.S second year module will help you develop knowledge and understanding of the:

- Basic concepts of molecular endocrinology that underpin hormone actions, how dysfunction relates to primary pathogenesis, and how this knowledge informs improvement in diagnosis and the potential for novel therapies
- Hypothalamic - pituitary axes and their role in health and disease, including the reproductive, adrenal, and thyroid axes
- Neuro-endocrine control of food intake, energy expenditure and obesity
- Theories of the etiology and pathogenesis of type 2 diabetes mellitus

Similarly, this module of endocrine system will enable you to recognize the clinical presentations of common endocrinological and metabolic disorders and relate clinical manifestations to basic sciences. This Endocrine module will be revisited in the following years.

The study guide will help you prioritize the important topics for learning in relation to the module objectives through lectures, demonstrations, tutorials, practicals and skills lab sessions.



**COURSE TOPICS, OBJECTIVES AND TEACHING STRATEGIES**

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

**ANATOMY**

<b>OUTCOMES &amp; OBJECTIVES</b>	<b>TEACHING STRATEGY</b>
<b>Anatomical Overview of All Endocrine Glands in Body</b>	Interactive Lectures & Small Group Discussion
1. Define and classify the glands	
2. Discuss functions of endocrine glands	
3. Describe the location of all endocrine glands in the body	
4. Briefly discuss the structure and functions of all endocrine organs in the body	
<b>Gross and Development of Pituitary Gland</b>	
5. Describe the location and parts of pituitary gland	
6. Name different cells present in the pituitary gland	
7. Enumerate the hormones released by the pituitary gland	
8. Discuss the hypophyseal portal system	
9. Describe the neurovascular supply of pituitary gland	
10. Explain the development of pituitary gland	
11. Discuss the clinical related condition of the pituitary gland	
<b>Microscopic Anatomy of Pituitary Gland</b>	
12. Enumerate different parts of adenohypophysis and neurohypophysis	
13. Explain the different cell types and their functions of both parts of pituitary gland	
14. Discuss the histological features of adenohypophysis and neurohypophysis	
<b>Review of Gross and Microscopic Anatomy of Thyroid and Parathyroid Gland</b>	
15. Describe the location of thyroid gland.	
16. Define the relations of lobes of thyroid and isthmus of thyroid with other structures in the neck	
17. Discuss the neurovascular supply of thyroid gland	
18. Explain the histological features of thyroid gland	
19. Discuss the types of cells found in the thyroid gland	
20. Discuss the clinical in relation to thyroid gland	
<b>Developmental and Microscopic Anatomy of Pancreas</b>	
21. Discuss the histological components of pancreas	
22. Describe the histological details of parenchyma and lobules (acini) of pancreas	
23. Explain the histology of endocrine component of pancreas	
24. Discuss different cell types of endocrine pancreas and their functions	
<b>Gross and Microscopic Anatomy of Adrenal Gland</b>	
25. Describe the gross anatomical features and location of the adrenal gland	



26. Discuss the neurovascular supply of the adrenal gland	
27. Discuss the histological features of adrenal gland	
28. Discuss the clinical conditions in relation to adrenal gland	
<b>Development and Anomalies of Adrenal Gland</b>	
29. Explain the embryological origin and development of the cortex and medulla of adrenal gland	
30. Discuss the developmental anomalies of the adrenal gland	
31. After observing the given slides, students should be able to describe the following microscopic structures: <ol style="list-style-type: none"> <li>1. Pituitary gland</li> <li>2. Pancreas</li> <li>3. Adrenal gland</li> </ol>	Practical

### **BIOCHEMISTRY**

<b>OUTCOMES &amp; OBJECTIVES</b>	<b>TEACHING STRATEGY</b>
<b>Introduction</b>	Interactive Lectures & Small Group Discussion
1. Explain the Endocrinology, classification and mechanism of action of hormones	
<b>Hypothalamic Hormones</b>	
2. Explain the structure, chemistry and biochemical function of Hypothalamic Hormone	
<b>Anterior Pituitary Hormone</b>	
3. Explain the growth hormone and related consequences in health and disease state	
4. Discuss pituitary hormones other than growth hormone with clinical complications and diseases.	
<b>Posterior Pituitary Hormone</b>	
5. Discuss in detail the chemistry, mechanism of action and function of posterior pituitary with clinical picture (biochemical abnormalities)	
<b>Thyroid Hormones</b>	
6. Explain the synthesis and metabolic function of thyroid hormone	
<b>Serum Calcium Regulation</b>	
7. Explain the synthesis and function of parathyroid hormone (calcium metabolism)	
<b>Pancreatic Hormones</b>	
8. Explain the structure and biochemical function of pancreatic hormone	
<b>Blood Glucose Regulation</b>	
9. Explain the regulation of blood glucose and their biochemical consequences.	
<b>Adrenal Cortex</b>	
10. Discuss the structure, synthesis and mechanism of action of Glucocorticoid hormones with related complications	

11. Discuss the structure, synthesis and mechanism of action of Mineralocorticoid and its abnormal secretion	Practical
<b>Adrenal Medulla</b>	
12. Explain the structure, function and Biochemical action of adrenal medulla with abnormalities.	
<b>Thyroid function tests:</b>	
13. Interpret results of Thyroid function tests	
<b>Tests of Diabetes</b>	
14. Describe the process of the Diabetes test	
15. Explain the use of Glucometer for the detection of blood glucose level	
<b>Oral Glucose Tolerance Test</b>	
16. Interpret the results of Oral Glucose Tolerance Test	

### **PHYSIOLOGY**

<b>OUTCOMES &amp; OBJECTIVES</b>	<b>TEACHING STRATEGY</b>
<b>Introduction to Endocrinology: Control and Feedback.</b>	Interactive Lectures & Small Group Discussion
1. Define hormone, target cell and receptor	
2. Contrast the term endocrine, paracrine and autocrine	
3. Classify hormones	
4. Describe the concept of second messenger	
5. Explain the principles of negative and positive feedback of hormonal secretion	
<b>Hypothalamus and anterior pituitary hormones.</b>	
6. Name hypothalamic factors that control secretion of ant pituitary hormones	
7. Name various cells of ant pituitary responsible for synthesis of hormones	
8. Describe the functions and regulation of GH, FSH, LH, ACTH, TSH and prolactin	
<b>Functions of Growth Hormone and associated disorders</b>	
9. Describe the functions and regulation of grown hormone.	
10. Describe the disorder associated with hypo and hyper secretion of GH.	
<b>Hormones of posterior pituitary and related disorders.</b>	
11. Describe the secretion of oxytocin and ADH	
12. Explain the mechanism of action and regulation of oxytocin and ADH	
13. Differentiate between neurogenic and nephrogenic diabetes insipidus	
<b>Functions of thyroid hormones</b>	
14. Explain the formation and secretion of T3 and T4	
15. Discuss the importance of iodine metabolism and iodine pump	
16. Describe actions of thyroid hormone on development and metabolism and associated disorders	
17. Describe the role of TSH on regulation of thyroid hormones	

<b>Calcium Homeostasis and vitamin D</b>	
18. Describe the synthesis of parathyroid and calcitonin hormone	
19. Explain the effects of parathyroid hormone on calcium balance	
20. Describe the factors that regulate the activities of osteoclasts and osteoblasts	
21. Describe the relationship between PTH and active form of vit D	
22. Explain the regulation of calcitonin secretion.	
23. List the disorders associated with calcium homeostasis	
<b>Insulin, Glucagon, Somatostatin</b>	
24. Explain the synthesis of insulin	
25. Describe insulin receptor	
26. Explain the role of insulin in maintaining blood glucose concentration	
27. Describe principal actions of glucagon and its regulation.	
28. Explain the functions of somatostatin on blood glucose	
<b>Functions of Glucocorticoids</b>	
29. Explain the synthesis of glucocorticoid hormones	
30. Identify the actions of glucocorticoids on metabolism and target cells	
31. Discuss the mechanism for regulation of glucocorticoid secretion.	
32. Describe the disorders associated with glucocorticoid hormones. (Addison's disease, Cushing syndrome)	
<b>Functions of mineralocorticoids</b>	
33. Explain the mechanism of action of mineralocorticoids.	
34. Discuss the mechanism of actions of aldosterone and its regulation.	
35. Define Aldosterone escape, Primary Aldosteronism and Androgenital Syndrome	
<b>Adrenal Medulla: secretion, function and disorders</b>	
36. Explain the mechanism of secretion and actions of medullary hormones.	
37. List the types of adrenergic receptors and their functions on target organs.	
38. Enumerate consequences of over and under secretion of medullary hormones (Pheochromocytoma)	
<b>Hypo and Hyper secretion of hormones (Growth Hormone, Thyroid Hormone, Insulin, Calcium metabolism, Adrenal Cortex)</b>	
39. Predict the effects of hypo and hyper secretion of major hormones of the body	
	Interactive Lectures & Small Group Discussion
	<b>Tutorial</b>

**LEARNING RESOURCES**

<b>SUBJECT</b>	<b>RESOURCES</b>
<b>ANATOMY</b>	<p><b>A. <u>GROSS ANATOMY</u></b></p> <ol style="list-style-type: none"> <li>1. K.L. Moore, Clinically Oriented Anatomy</li> <li>2. Neuro Anatomy by Richard Snell</li> </ol> <p><b>B. <u>HISTOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. B. Young J. W. Health Wheather's Functional Histology</li> </ol> <p><b>C. <u>EMBRYOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. Keith L. Moore. The Developing Human</li> <li>2. Langman's Medical Embryology</li> </ol>
<b>BIOCHEMISTRY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Harper's Illustrated Biochemistry</li> <li>2. Lehninger Principle of Biochemistry</li> <li>3. Biochemistry by Devlin</li> </ol>
<b>PHYSIOLOGY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Textbook Of Medical Physiology by Guyton And Hall</li> <li>2. Ganong ' S Review of Medical Physiology</li> <li>3. Human Physiology by Lauralee Sherwood</li> <li>4. Berne &amp; Levy Physiology</li> <li>5. Best &amp; Taylor Physiological Basis of Medical Practice</li> </ol> <p><b>B. <u>REFERENCE BOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Guyton &amp; Hall Physiological Review</li> <li>2. Essentials Of Medical Physiology by Jaypee</li> <li>3. Textbook Of Medical Physiology by InduKhurana</li> <li>4. Short Textbook Of Physiology by Mrthur</li> <li>5. NMS Physiology</li> </ol>

**OTHER LEARNING RESOURCES**

<b><u>Hands-on Activities/ Practical</u></b>	Students will be involved in Practical sessions and hands-on activities that link with the endocrine module to enhance the learning.
<b><u>Labs</u></b>	Utilize the lab to relate the knowledge to the specimens and models available.
<b><u>Skills Lab</u></b>	A skills lab provides the simulated learning experience to learn the basic skills and procedures. This helps build the confidence to approach the patients.
<b><u>Videos</u></b>	Video familiarize the student with the procedures and protocols to assist patients.
<b><u>Computer Lab/CDs/DVDs/Internet Resources:</u></b>	To increase the knowledge students should utilize the available internet resources and CDs/DVDs. This will be an additional advantage to increase learning.
<b><u>Self Learning</u></b>	Self Learning is scheduled 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.

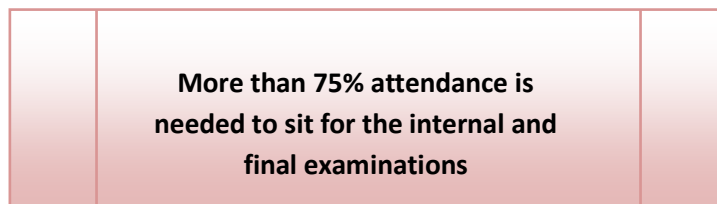
**Internal Evaluation**

- 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!**



**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	30 <sup>th</sup> Dec 2019
WEEK 2		
WEEK 3		
WEEK 4		
WEEK 5		31 <sup>st</sup> Jan 2020
WEEK 1	NEUROSCIENCES MODULE	3 <sup>rd</sup> Feb 2020
WEEK 2		
WEEK 3		
WEEK 4		
WEEK 5		
WEEK 6		28 <sup>th</sup> March 2020
WEEK 1	SPECIAL SENSES - I MODULE	30 <sup>th</sup> March 2020
WEEK 2		
WEEK 3		9 <sup>th</sup> May 2020
WEEK 1	ENDOCRINE-I MODULE	12 <sup>th</sup> May 2020
WEEK 2		
WEEK 3		
WEEK 4		June 2020*
Revision Classes (Earlier Modules)		2020*

\*Final dates will be announced later.