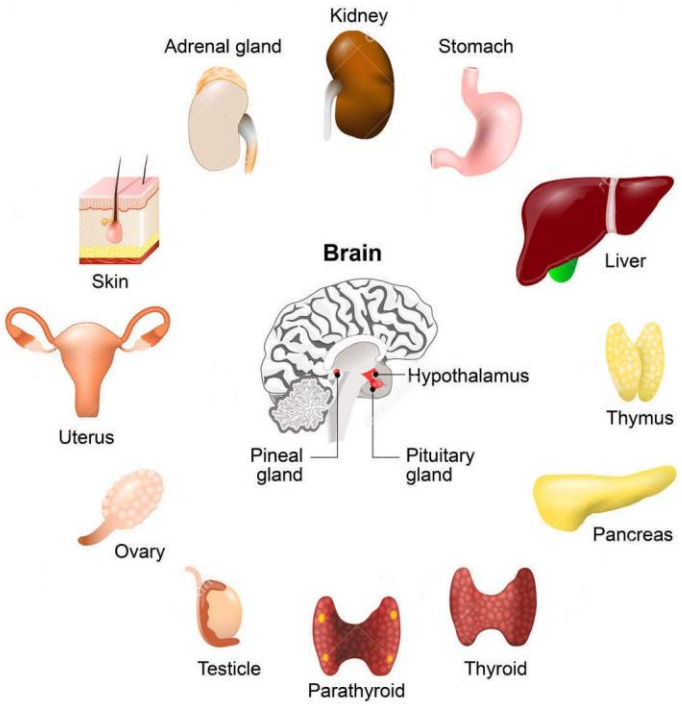
ENDOCRINE SYSTEM



STUDY GUIDE

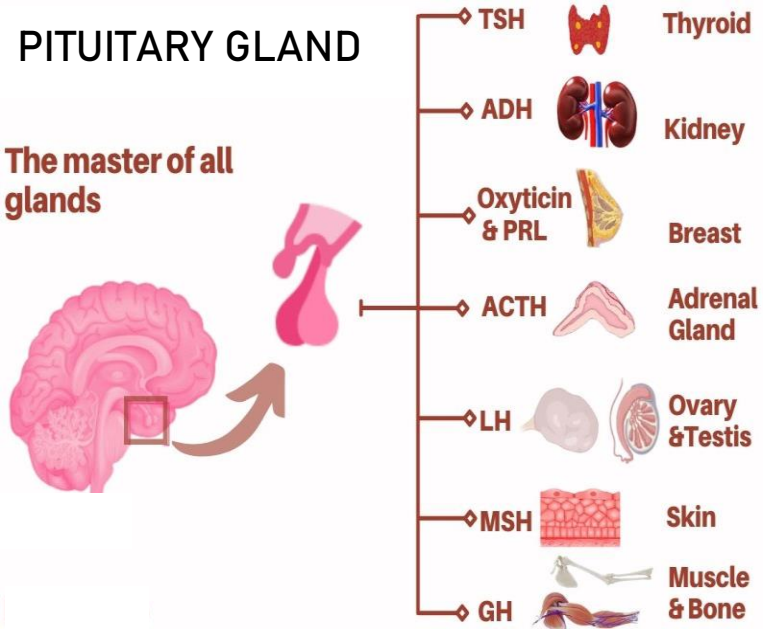
SECOND YEAR MBBS

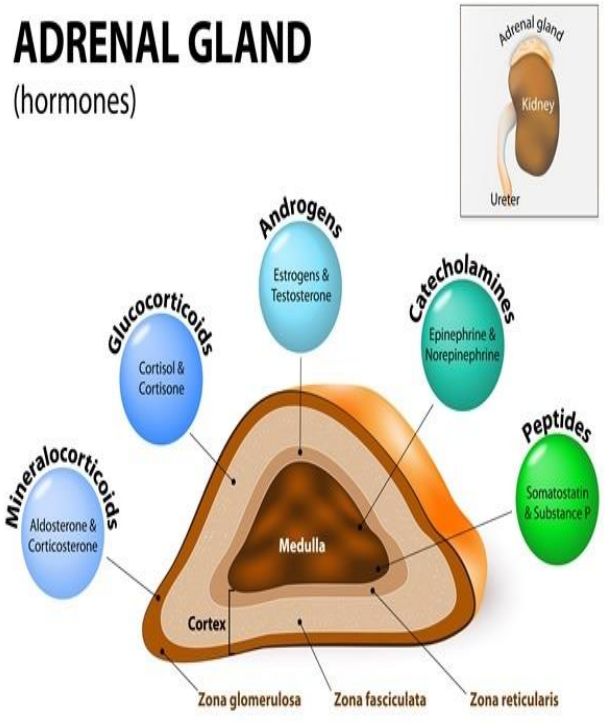
1st AUG- 26th AUG 2022

DURATION: 4 WEEKS

Insulin

ENDOCRINE MODULE-I





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

STUDY GUIDE FOR ENDOCRINE MODULE

Module name: **Endocrine** *Year:* ***Two*** *Duration:* ***4 weeks (Aug 2022)***

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

MODULE INTEGRATED COMMITTEE

MODULE COORDINATOR:	Prof. Shaheen Sharafat (***Microbiology***)
CO-COORDINATORS:	Dr. Fizzah Ali **(** ***Pharmacology***)

DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING

BASIC HEALTH SCIENCES	CLINICAL AND ANCILLARY DEPARTMENTS
ANATOMY Professor Zia-ul-Islam	***ENDCOCRINOLOGY*** Dr. Aqiba Sarfraz
BIOCHEMISTRY Professor Kashif Nisar	***RESEARCH & SKILLS DEVELOPMENT CENTER*** Dr. Kahkashan Tahir
PATHOLOGY Professor Naveen Faridi	
PHARMACOLOGY Professor Tabassum Zehra	
PHYSIOLOGY Professor Syed Hafeezul Hassan	

DEPARTMENT OF HEALTH PROFESSIONS EDUCATION

- Professor Nighat Huda
- Professor Sobia Ali
- Dr. Afifa Tabassum
- Dr. Sana Shah

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 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:

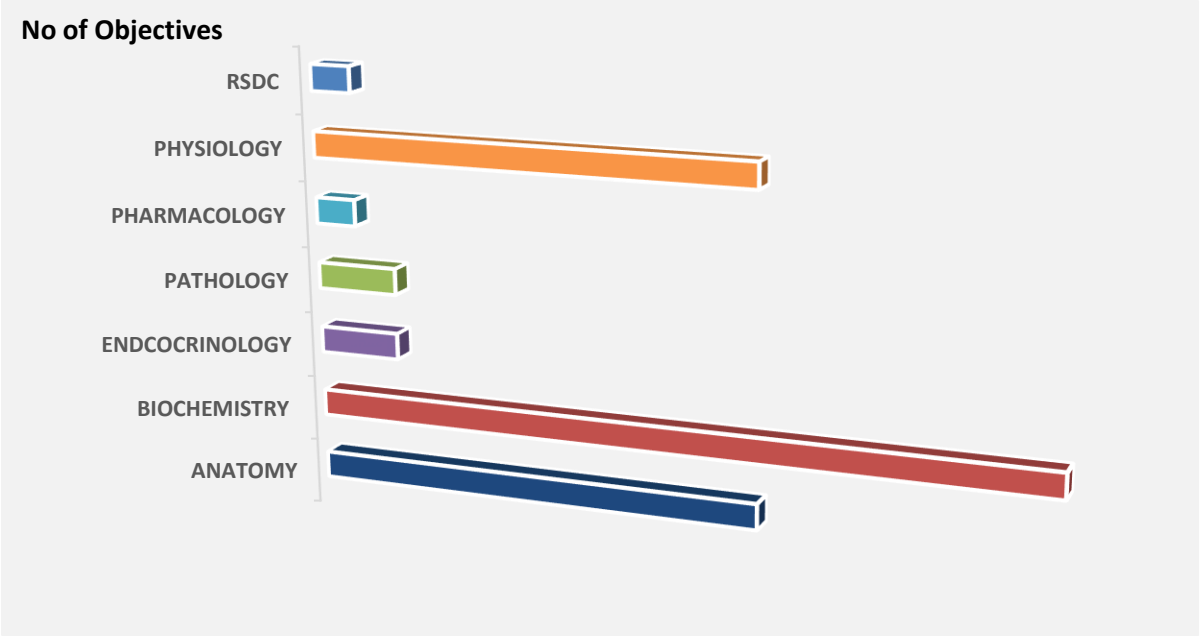
- Communicates information on organization and management of the module. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as lectures, small 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 and journals for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous and 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 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 & Special Senses, 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 are characteristics of integrated teaching program.

INTEGRATING DISCIPLINES OF ENDOCRINE MODULE-I



LEARNING METHODOLOGIES

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

- Interactive Lectures
- Small Group Discussion
- Case- Based Learning
- Practicals
- Skills session
- Flipped Classroom
- 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.

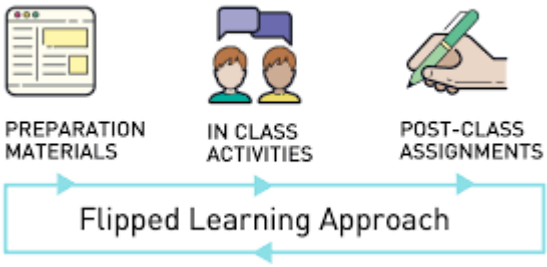
SMALL GROUP DISCUSSION: This format helps students to clarify concepts acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient case, interviews or discussion topics. Students exchange opinions and apply knowledge gained from lectures, tutorials and self 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.

FLIPPED CLASSROOM: A flipped classroom is a **type of blended learning** where students are introduced to content at home and practice working through it at classroom. This is the reverse of the more common practice of introducing new content classrooms, then assigning homework and projects to completed by the students independently at home.



The concept behind the flipped classroom is to rethink when students have access to the resources they need most. If the problem is that students need help doing the work rather than being introduced to the new thinking behind the work, then the solution the flipped classroom takes is to reverse that pattern.

SELF DIRECTED LEARNING: 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-directed learning.

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

MODULE 4: ENDOCRINE

INTRODUCTION

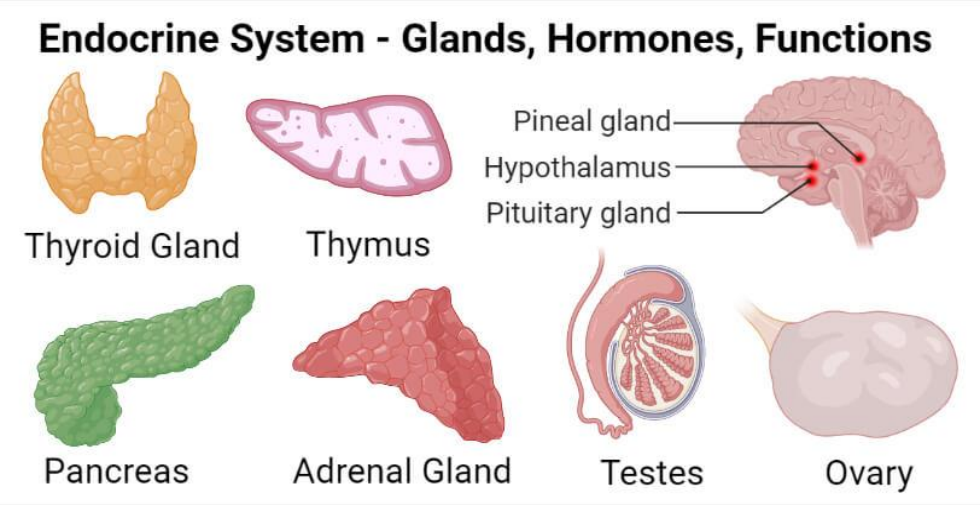
The Endocrine system relays information and maintains a constant internal environment of the body called homeostasis. It acts through chemical messengers called hormones that influence growth, development, and metabolic activities. The action of the endocrine system is measured in minutes, hours, or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

TOPICS & OBJECTIVES	LEARNING STRATEGIES
1. Anatomical overview of all endocrine glands in body	Interactive Lecture
• Classify the glands	
• Define endocrine glands	
• Describe the location of all endocrine glands in the body	
• Discuss the functions of all endocrine organs in the body	
2. Gross anatomy and development of the Pituitary gland	Interactive Lecture/ Tutorial
• Describe the location, relations and external features, and division/components of pituitary gland	
• Describe the neurovascular supply of pituitary gland	
• Discuss the hypophyseal portal system	
• Explain the development of pituitary gland	
• Discuss the related clinical conditions & congenital anomalies of the pituitary gland	
3. Microscopic anatomy of the Pituitary gland	Interactive Lecture/ Practical
• Enumerate different parts of adenohypophysis and neurohypophysis	
• Discuss the histological features of adenohypophysis and neurohypophysis	
• Explain the different cell types and functions of both parts of pituitary gland	
4. Review of gross and microscopic anatomy of the Thyroid and Parathyroid glands	Interactive Lecture/ Tutorial
• Summarize the location, relations & neurovascular supply of thyroid gland	
• Explain the histological features of thyroid and parathyroid glands	
• Discuss the types of cells found in the thyroid gland	
• Discuss the clinical conditions in relation to thyroid gland	
• Describe the cells found in parathyroid gland and their functions	
5. Developmental and microscopic anatomy of the Pancreas	
• Discuss the histological components of pancreas	
• Describe the histological details of parenchyma and lobules of pancreas	
• Explain the histology of endocrine component of pancreas	
• Discuss different cell types of endocrine pancreas and their functions	
• Describe the formation of dorsal and ventral pancreatic bud	
• Discuss the development of main pancreatic duct.	
• Explain the different congenital anomalies of pancreas	
6. Gross and microscopic anatomy of the Adrenal Gland	
• Describe the gross anatomical features and location of the adrenal gland	
• Discuss the neurovascular supply, and the histological features of adrenal gland	
• Describe the cells found in cortex and medulla	
• Discuss the clinical conditions in relation to adrenal gland	

7. Development and anomalies of the Adrenal Gland	
• Explain the embryological origin and development of the adrenal gland	
• Discuss the developmental anomalies of the adrenal gland	
8. Histology of Pituitary gland	Practical
• Identify the slide of Pituitary gland	
• Describe the microscopic features of pituitary gland	
9. Histology of Thyroid and Parathyroid gland	
• Identify the slide of Thyroid and Parathyroid gland	
• Discuss the microscopic features of Thyroid and Parathyroid gland	
10. Histology of Pancreas	
• Identify the slide of Pancreas	
• Explain the microscopic features of Pancreas	
11. Histology of Adrenal gland	
• Identify the slide of Adrenal gland	
• Describe the microscopic features of Adrenal gland	

BIOCHEMISTRY

TOPICS & OBJECTIVES	LEARNING STRATEGIES
1. Introduction to Hormones	Interactive Lecture/ Tutorial
• Classify hormones according to the mechanism of action, and give examples	
• Classify hormone receptors with examples	
• Describe the role of second messenger system	
• Summarize the hormones of the body with their functions	
2. Hypothalamic Hormones	Interactive Lecture
• List the hypothalamic hormones	
• Explain the chemical structure and biochemical functions of Hypothalamic hormones	
• List the stimulatory and inhibitory hypothalamic hormones	
• Discuss the hypothalamic control of pituitary hormones	
• Describe the feedback mechanism of hypothalamic hormones	
• Describe the mechanism of circadian rhythm	
3. Anterior Pituitary Hormones (Growth Hormone)	
• List the anterior pituitary hormones	
• Explain the chemical nature of growth hormone	
• Explain the mechanism of action of growth hormone	
• Discuss the synthesis and metabolic effects of growth hormone	
• Discuss clinical complications and diseases associated with growth hormone	
4. Anterior Pituitary Hormones (ACTH, LH, FSH, TSH and PRL)	Interactive Lecture/ Tutorial
• Explain the chemical structure of anterior pituitary hormones	
• Describe the mechanism of action and biochemical functions of anterior pituitary hormones	
• Discuss the hypothalamic control of pituitary hormones	

• Discuss the regulation of anterior pituitary hormone	
• Describe the clinical diseases associated with anterior pituitary hormones	
5. Posterior Pituitary Hormones	
• List the posterior pituitary hormones	
• Explain the synthesis chemical structure of posterior pituitary hormones	
• Describe the mechanism of action, biochemical functions of posterior pituitary hormone	
• Discuss the hypothalamic pituitary axis of posterior pituitary hormones	
• Discuss the regulation of posterior pituitary hormone	
• Describe the clinical diseases associated with posterior pituitary hormones	
6. Thyroid Hormones	
• List the Thyroid hormones	
• Discuss the cells type and production of thyroid hormones	
• Explain the synthesis and chemical structure of Thyroid hormones	
• Describe the mechanism of action and metabolic functions of Thyroid hormones	
• Discuss the hypothalamic pituitary axis of Thyroid hormones	
• Discuss the regulation of Thyroid hormones and feedback mechanism	
• Describe the clinical diseases and complication associated with Thyroid hormones	
7. Parathormone: Serum Calcium Regulation	Interactive Lecture
• List the hormones regulating serum calcium (Parathormone, Calcitriol and calcitonin)	
• Explain the synthesis chemical structure of Parathormone	
• Describe the mechanism of action, metabolic functions (on GIT, Skeleton & Kidneys), and regulation of Parathormone	
• Describe the role of 1,25-dihydroxy vitamin D in calcium homeostasis	
• Describe the role of Calcitonin in calcium regulation	
• Describe the clinical diseases and complication associated with Parathormone	
8. Pancreatic Hormones	
• List the pancreatic hormones (Insulin, glucagon and somatostatin)	
• Explain the synthesis and chemical structure of pancreatic hormones	
• Describe the mechanism of action, metabolic functions, and regulation of pancreatic hormones	
• Describe the clinical diseases associated with pancreatic hormones	
• Discuss the clinical importance of pancreatic hormones	
• Correlate the laboratory investigations with relevant clinical conditions	
9. Blood Glucose Regulation	Interactive Lecture/ Case- Based Learning
• Explain the regulation of blood glucose	
• Discuss the tissues which regulate fuel metabolism in blood glucose level	
• Describe the mechanism of metabolic regulation of blood glucose	
• Discuss the biochemical complications of hypoglycemia and hyperglycemia	
10. Blood Glucose: Diabetes Mellitus (DM) and its complications	Interactive Lecture
• Classify diabetes mellitus	
• Differentiate between Type I and Type II diabetes mellitus	
• Describe the biochemical causes of development of diabetes mellitus	
• Discuss the factors responsible for metabolic changes in DM	
• Discuss the clinical significance of diabetes mellitus and its complications	
• Discuss the diagnostic investigations for diabetes mellitus	

• Enumerate the biochemical tests to detect Diabetes Mellitus	
• Describe the diagnostic criteria of Diabetes correlated with their laboratory investigations	
11. Adrenal hormones: Glucocorticoids	Interactive Lecture/Case- Based Learning
• List the adrenal cortex hormones	
• Explain the synthesis chemical structure of glucocorticoids	
• Describe the mechanism of action and metabolic functions of glucocorticoids	
• Discuss the regulation of glucocorticoids	
• Describe the clinical diseases and complications associated with glucocorticoids	
12. Adrenal hormones: Mineralocorticoids	Interactive Lecture
• Explain the synthesis chemical structure of mineralocorticoids	
• Describe the mechanism of action, metabolic functions, and regulation of mineralocorticoids	
• Describe the clinical diseases and complication associated with mineralocorticoids	
13. Adrenal hormones: Adrenal medullary hormones	
• List the adrenal medullary hormones	
• Explain the synthesis and chemical structure of adrenal medullary hormones	
• Describe the mechanism of action and metabolic functions of adrenal medullary hormones	
• Discuss the regulation of adrenal medullary hormones	
• Describe the clinical diseases and complication associated with adrenal medullary hormones	
14. Pituitary hormones (Gigantism, Acromegaly, Dwarfism etc)	Case- Based Learning
• Discuss the clinical importance of Pituitary hormones	
• Correlate the laboratory investigations with relevant clinical conditions	
15. Thyroid & adrenal hormones (Goiter, Hypothyroidism & Hyperthyroidism, Addison's diseases etc.)	Interactive Lecture
• Discuss the clinical importance of thyroid & adrenal hormones	
• Correlate the laboratory investigations with relevant clinical conditions	
16. Thyroid function tests	Practical
• Identify the chemical tests and bio-techniques to estimate the functions of the thyroid glands	
• Correlate the laboratory investigations with relevant clinical conditions	
17. Blood glucose estimation by glucometer	
• Enumerate the chemical tests to detect diabetes mellitus	
• Describe the diabetes diagnostic criteria	
• Outline the method for estimation of blood glucose by glucometer	
• Describe the principle of glucometer	
• Perform blood glucose estimation by glucometer	
• Correlate the laboratory investigations with relevant clinical conditions	
18. Oral Glucose Tolerance Test (OGTT)	
• Explain the significance of OGTT and glucose challenge tests (GCT)	
• Explain the method of performance of OGTT and GCT	
• Perform OGTT and GCT	
• Interpret the results of Oral Glucose Tolerance Test & GCT	
• Estimate urine glucose with urine glucose reagent strip	
• Correlate the laboratory investigations with relevant clinical conditions	

ENDCOCRINOLOGY

TOPICS & OBJECTIVES	LEARNING STRATEGIES
1. Approach to Diabetic Foot	Interactive Lecture
• Discuss the complication of diabetes which includes Diabetic Foot	
2. Thyroid Examination	Tutorial
• Assess the thyroid gland and its relative examination, including inspection, palpation and auscultation	

PATHOLOGY

TOPICS & OBJECTIVES	LEARNING STRATEGIES
1. Pathogenesis of diabetes	Interactive Lecture
• Enumerate the diagnostic criteria of Diabetes Mellitus and describe the pathogenesis and clinical features of type 1 and type 2 diabetes	
2. Diabetic ketoacidosis (DKA)	Case- Based Learning
• Discuss the basic pathophysiology of Diabetic Ketoacidosis	

PHARMACOLOGY

TOPICS & OBJECTIVES	LEARNING STRATEGIES
Management of Diabetes Mellitus	Interactive Lecture
• Understand the basic pharmacology of oral hypoglycemic agents and insulin	

PHYSIOLOGY

TOPICS & OBJECTIVES	LEARNING STRATEGIES
1. Introduction to Endocrinology: Control and feedback of hormones	Interactive Lecture/ Tutorial
• Define hormone, target cell and receptor	
• Contrast the term endocrine, paracrine and autocrine	
• Classify hormones	
• Describe the concept of second messenger	
• Explain the principles of negative and positive feedback of hormonal secretion	

2. Hypothalamus and anterior pituitary hormones	
• Name hypothalamic factors that control secretion of anterior pituitary hormones	
• Name various cells of anterior pituitary responsible for synthesis of hormones	
• Describe the functions and regulation of GH, FSH, LH, ACTH, TSH and prolactin	
• Explain the hypothalamic hypophyseal portal system	
3. Functions of Growth Hormone and associated disorders	Flipped Classroom/ Interactive Lecture
• Describe the functions and regulation of grown hormone	
• Describe the disorders associated with hypo and hyper secretion of GH	
4. Hormones of Posterior Pituitary and related disorders	Interactive Lecture
• Describe the secretion of oxytocin and ADH	
• Explain the mechanism of action and regulation of oxytocin and ADH	
5. Functions of Thyroid hormones	Interactive Lecture/ Case- Based Learning
• Explain the formation and secretion of T3 and T4	
• Discuss the importance of iodine metabolism and iodine pump	
• Describe actions of thyroid hormone on development and metabolism and associated disorders	
• Describe the role of Thyroid stimulating hormone (TSH) on thyroid hormone regulation	
6. Functions of Parathyroid (PTH) and Calcitonin hormone (Calcium homeostasis)	
• Describe the synthesis of parathyroid and calcitonin hormone	
• Explain the effects of parathyroid hormone on calcium balance	
• Describe the factors that regulate the activities of osteoclasts and osteoblasts	
• Describe the relationship between PTH and active form of vit D	
• Explain the regulation of calcitonin secretion	
• List the disorders associated with calcium homeostasis (tetany, Chovstek's sign)	
7. Hormonal secretion of the Pancreas (Insulin)	
• Explain the synthesis of insulin	
• Describe the insulin receptor	
• Explain the role of insulin in maintaining blood glucose concentration	
• Differentiate between neurogenic and nephrogenic diabetes insipidus	
8. Hormonal secretion of the Pancreas (Glucagon, somatostatin)	Interactive Lecture/ Tutorial
• Describe principal actions of glucagon and its regulation	
• Explain the functions of somatostatin on blood glucose	
9. Adrenal cortex (Functions of Glucocorticoids)	Interactive Lecture/ Case- Based Learning
• Explain the synthesis of glucocorticoid hormones	
• Identify the actions of glucocorticoids on metabolism and target cells	
• Discuss the mechanism for regulation of glucocorticoid secretion	
• Describe the disorders associated with glucocorticoid hormones (Addison's disease, Cushing syndrome)	
10. Adrenal cortex (Functions of Mineralocorticoids)	Interactive Lecture/ Tutorial
• Define Aldosterone escape, Primary Aldosteronism and Androgenital Syndrome	
• Explain the mechanism of action of mineralocorticoids	
• Discuss the mechanism of actions of aldosterone and its regulation	
11. Adrenal Medulla (secretion, function and disorders)	
• Explain the mechanism of secretion and actions of medullary hormones	
• List the types of adrenergic receptors and their functions on target organs	
• Enumerate consequences of over and under secretion of medullary hormones (pheochromocytoma)	

RESEARCH & SKILLS DEVELOPMENT CENTER

TOPICS & OBJECTIVES	LEARNING STRATEGIES
• Identify the sites for insertion of subcutaneous injections	Hands on
• Properly insert the insulin syringe.	
• Demonstrate the proper venting technique of the insulin according to the required dose	

LEARNING RESOURCES

SUBJECT	*RESOURCES*
ANATOMY	**A. GROSS ANATOMY** 1. K.L. Moore, Clinically Oriented Anatomy 2. Neuro Anatomy by Richard Snell **B. HISTOLOGY** 1. B. Young J. W. Health Wheather's Functional Histology **C. EMBRYOLOGY** 1. Keith L. Moore. The Developing Human 2. Langman's Medical Embryology
BIOCHEMISTRY	**A. TEXTBOOKS** 1. Harper's Illustrated Biochemistry 2. Lehninger Principle of Biochemistry 3. Biochemistry by Devlin
PATHOLOGY/MICROBIOLOGY	**A. TEXT BOOKS** 1. Robbins & Cotran, Pathologic Basis of Disease, 9th edition. 2. Rapid Review Pathology, 4th edition by Edward F. Goljan MD 1. http://library.med.utah.edu/WebPath/webpath.html 2. http://www.pathologyatlas.ro/
PHARMACOLOGY	**A. TEXT BOOKS** 1. Lippincot Illustrated Pharmacology 2. Basic and Clinical Pharmacology by Katzung
PHYSIOLOGY	**A. TEXTBOOKS** 1. Textbook Of Medical Physiology by Guyton And Hall 2. Ganong ' S Review of Medical Physiology 3. Human Physiology by Lauralee Sherwood 4. Berne & Levy Physiology 5. Best & Taylor Physiological Basis of Medical Practice **B. REFERENCE BOOKS** 1. Guyton & Hall Physiological Review 2. Essentials Of Medical Physiology by Jaypee 3. Textbook Of Medical Physiology by InduKhurana 4. Short Textbook Of Physiology by Mrthur 5. NMS Physiology

ASSESSMENT METHODS:

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

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 examination

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	MONTH
WEEK 1	ENDOCRINE MODULE	1st August 2022
WEEK 2		
WEEK 3		
WEEK 4		26th August 2022
WEEK 1	REPRODUCTIVE MODULE	29th August 2022
WEEK 2		
WEEK 3		
WEEK 4		24th September 2022*
WEEK 1	RENAL & EXCREATORY MODULE	26th September 2022*
WEEK 2		
WEEK 3		
WEEK 4		22nd October 2022*
PRE-PROF EXAM*		

*Final dates will be announced later.