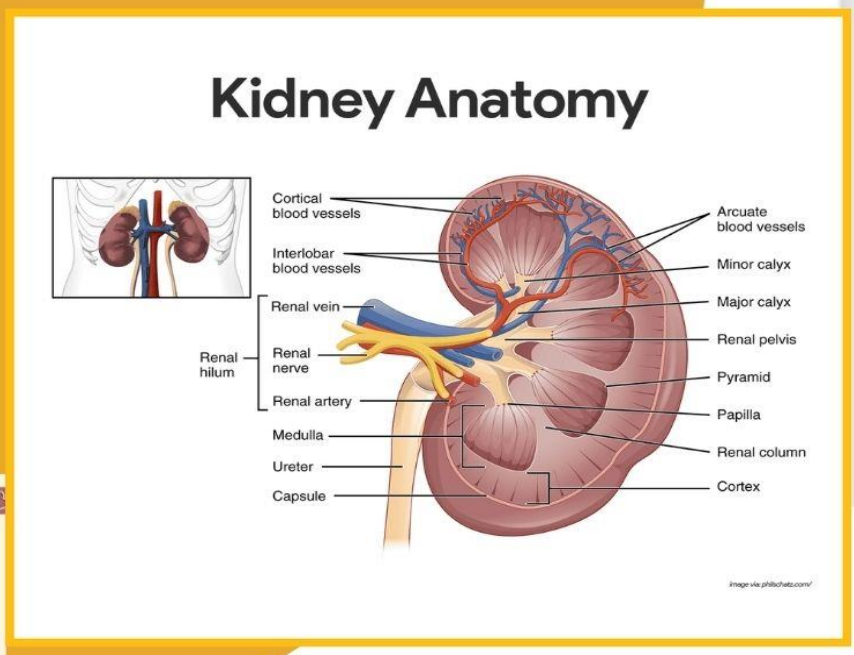
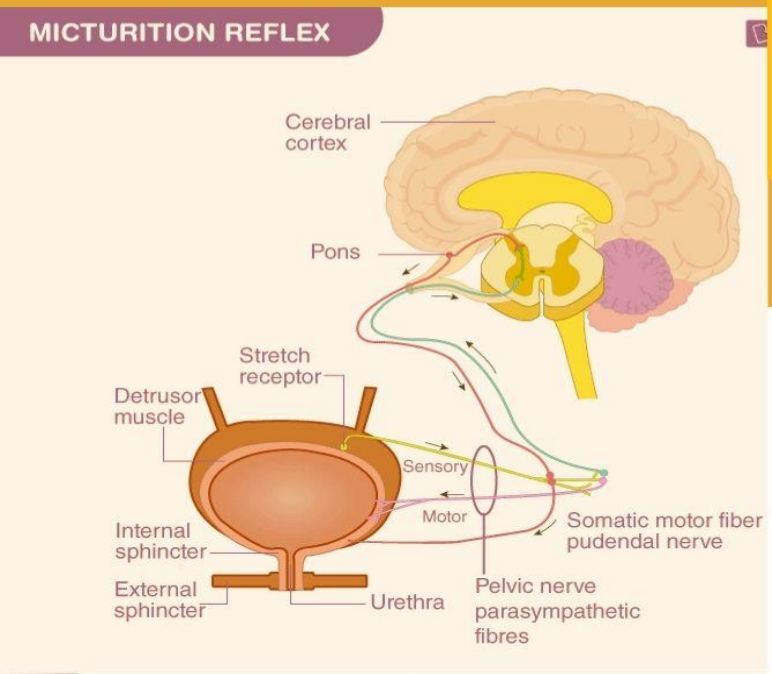
STUDY GUIDE-SECOND YEAR MBBS

26th September- 20th October 2022

Duration: 4 Weeks

RENAL AND EXCRETORY SYSTEM MODULE I





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

STUDY GUIDE FOR RENAL AND EXCRETORY SYSTEM-I MODULE

Module name: **Renal & Excretory System-I** *Year:* ***Two*** *Duration:* ***4 weeks (Sep – Oct 2022)***

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

MODULE INTEGRATED COMMITTEE

MODULE COORDINATOR:	• Dr Naila Parveen (**Physiology**)
CO-COORDINATORS:	• Dr Faiza Agha (**Biochemistry**)

DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING

BASIC HEALTH SCIENCES	CLINICAL AND ANCILLARY DEPARTMENTS
ANATOMY Professor Zia-ul-Islam	***MEDICINE*** Professor KU Makki
BIOCHEMISTRY Professor Kashif Nisar	***NEPHROLOGY*** Dr. Kunwer Naveed
COMMUNITY MEDICINE Dr. Saima Zainab	***RADIOLOGY*** Dr. Muhammad Misbah Tahir
MICROBIOLOGY Professor Shaheen Sharafat	***RESEARCH & SKILLS DEVELOPMENT CENTER*** Dr. Kahkashan Tahir
PATHOLOGY Professor Naveen Faridi	
PHARMACOLOGY Professor Tabassum Zehra	
PHYSIOLOGY Professor Syed Hafeezul Hassan	
DEPARTMENT of HEALTH PROFESSION EDUCATION • Professor Nighat Huda • Professor Sobia Ali • Dr. Afifa Tabassum • Dr. Sana Shah	
LNH&MC MANAGEMENT • Professor Karimullah 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 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 Interactive 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 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.

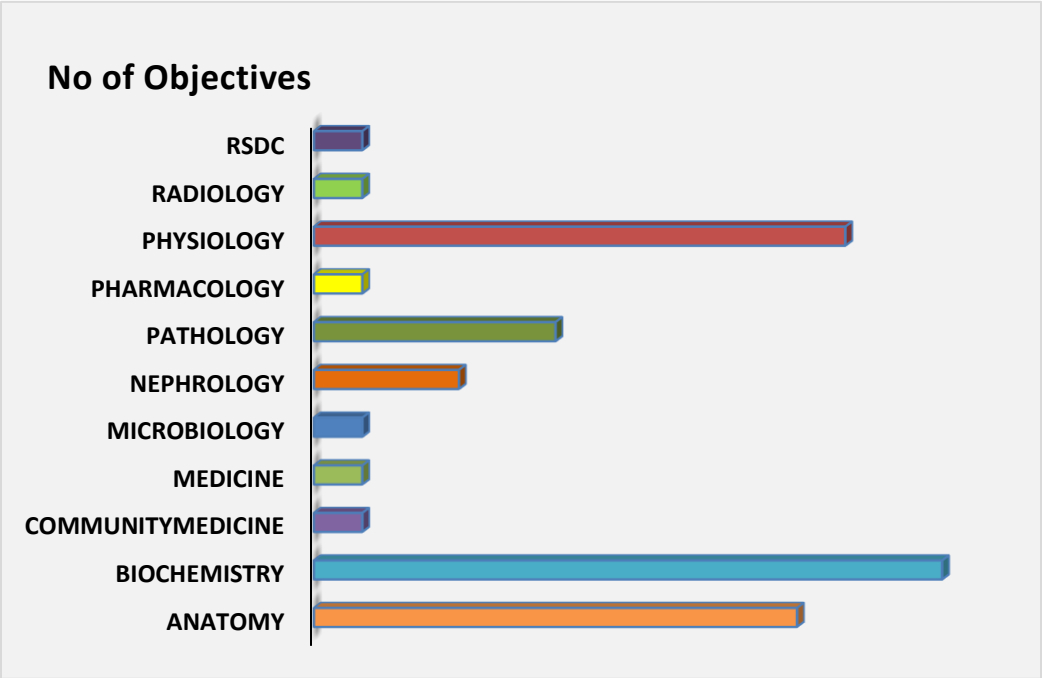
CURRICULUM FRAMEWORK

Students will experience integrated curriculum in the modules 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 I and Endocrinology, Reproductive System-I and Renal and Excretory System-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 and physiotherapy department are characteristics of integrated teaching program.

INTEGRATING DISCIPLINES OF RENAL & EXCRETORY 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
- Self-Study

INTERACTIVE LECTURES

In large group, the Interactive 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 (SGD): 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 Interactive 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: RENAL & EXCRETORY SYSTEM-I

Rationale:

Renal system and excretory system is responsible for the body to get rid of waste and toxic substances. In this module the renal and excretory system will be examined in detail with emphasis on how the renal system develops and functions on a cellular level as well as the mechanisms that underlie renal diseases such as electrolyte imbalance, dehydration, renal hypertension, renal failure, polycystic kidney, nephrotic and nephritic syndrome.

This module will enable the students of second year to recognize the clinical presentations of common renal diseases and relate clinical manifestations to basic sciences. It will be further revisited in the following years.

COURSE TOPICS, OBJECTIVES AND STRATEGIES

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

ANATOMY

OBJECTIVES	LEARNING STRATEGY
1. Gross anatomy of kidneys	Interactive Lecture/ Tutorial
• Describe the gross structure of kidney, its location and shape	
• Discuss the coverings, and cortex and medulla, relations and functions of kidneys	
• Discuss the clinical conditions related to kidneys	
2. Blood supply, nerve supply and lymphatic drainage of kidneys	
• Describe in sequence the structures passing through the hilum of kidneys	
• Discuss the blood supply of kidney in detail, with clinical segmentation of kidney according to its blood supply	
• Discuss the nerve supply and lymphatic drainage of kidney	
• Discuss the clinical conditions related to blood supply of kidney	
3. Gross anatomical features of ureter and urinary bladder & urethra	
• Enumerate the parts of urinary system (ureter, urinary bladder and urethra)	
• Describe the structure, course, anatomical constrictions, and relations of ureter	
• Explain the location, apex, base, surfaces and relations of urinary bladder	
• Describe the trigone of the urinary bladder	
• Explain the support to the urinary bladder	
• Describe the blood supply, nerve supply and lymphatic drainage of ureter, urinary bladder and urethra	
4. Surface anatomy of Urinary system	Tutorial
• Mark the following structures on the surface of a human body/ mannequin:	
i. Kidney	
ii. Ureter	
iii. Urinary bladder	
5. Histological features of kidney	Interactive Lecture/ Practical
• Describe the histological features of kidney (cortex & medulla)	
• Discuss the histological features of a nephron and their types	
• Describe the filtration barrier and its significance	
• Explain the juxtaglomerular apparatus, its location and significance	
6. Histological features of ureter, urinary bladder and urethra	
• Discuss the lining epithelium of Ureter, Urinary Bladder & Urethra	
• Describe the arrangement of layers in ureter, urinary bladder and urethra & their microscopic appearance	
7. Development of kidney, ureter & urinary bladder	Interactive Lecture
• Describe the role of intermediate mesoderm in the formation of kidney	

• Describe the development and the fate of the three progenitors of urinary system: pronephros, mesonephros and metanephros	
• Discuss the development of the following:	
i. Nephron	
ii. Collecting system of kidney	
iii. Ureter	
iv. Urinary bladder	
8. Anomalies of kidney, ureter & urinary bladder	
• Describe the congenital anomalies of kidney (polycystic kidney, pelvic kidney, horseshoe kidney), ureter (Bifid ureter) and urinary bladder	
9. Histological features of kidneys	Practical
• Identify renal corpuscle	
• Differentiate proximal and distal convoluted tubules	
• Identify medullary rays, collecting tubules and collecting ducts	
• Describe the histological features of kidneys	
10. Histological features of Ureter & Urinary Bladder	
• Identify the microscopic appearance and structure of the ureter & urinary bladder	
• Discuss the microscopic features of ureter and urinary bladder	

BIOCHEMISTRY

OBJECTIVES	LEARNING STRATEGY
WATER DISTRIBUTION, REGULATION & DISTURBANCES	Interactive Lecture/ Case-Based Learning
1. Water distribution, regulation & disturbances	
• Describe the distribution of water in the body	
• Discuss the hormonal regulations of water homeostasis and their exchanges	
• Explain the regulatory mechanism by which the water balance is maintained	
• Discuss the biochemical consequences of dehydration and overhydration	
• Discuss the clinical disorders associated with water balance abnormalities and their management	
2. PH Disturbances	Interactive Lecture
• Describe the maintenance of normal pH	
• Discuss the renal mechanism of pH regulation	
• Discuss the biochemical consequences of respiratory and metabolic acidosis and alkalosis	
• Explain the compensatory mechanism in metabolic pH disturbances	
• Discuss the Arterial blood gases (ABGs) in metabolic pH disturbances	
• Discuss the ABGs in compensated metabolic pH disturbances	
3. Sodium and chloride disturbances	
• List the sources of dietary sodium and chloride	
• Discuss the normal daily requirement of Sodium and chloride	
• Explain the distribution of sodium in extracellular and intracellular compartments	

• Describe the biochemical role and metabolism of Sodium and chloride	
• Discuss the clinical disorders associated with sodium and chloride disturbances (e.g. Hypertension)	
• Discuss the laboratory investigations related with the disturbances of these electrolytes (e.g. dehydration and over-hydration)	
4. Potassium and phosphate disturbances	
• List the sources of dietary potassium and phosphate	
• Discuss the normal daily requirement of potassium and phosphate	
• Explain the distribution of potassium and phosphate in extracellular and intracellular compartments	
• Describe the biochemical role and the metabolism of potassium and phosphate	
• Discuss the clinical disorders associated with potassium and phosphate disturbances (e.g. hypokalemia & hyperkalemia)	
• Discuss the laboratory investigations related with the disturbances of these electrolytes	
5. Renal Function tests	Tutorial
• Discuss the clinical importance of renal disorders	
• Discuss the importance of renal function tests for the diagnosis of renal disorders	
• List the renal function tests	
• Explain the renal function tests	
• Interpret clinical conditions correlated with their laboratory investigations	
NUCLEOTIDE METABOLISM	Interactive Lecture
6. Purine Synthesis	
• Discuss the structure and biochemical functions of nucleotides	
• Name the different types of purines	
• Describe the sources of carbon and nitrogen atoms in the purine ring	
• Discuss the process of purine synthesis (Denovo and salvage pathways)	
• Discuss the biochemical abnormalities related to purine synthesis (e.g. Lesch –Nyhan Syndrome & Von Gierke's Diseases)	
7. Purine Degradation	
• Describe the fate of dietary nucleoproteins	
• Discuss the degradation of tissue purine nucleotides	
• Explain the formation of uric acid	
• Discuss the clinical significance of purine degradation abnormalities (e.g. Gout, Severe combined immunodeficiency diseases, purine nucleoside phosporylase deficiency and hypouricemia)	
8. Pyrimidine Metabolism	Interactive Lecture/ Tutorial
• Discuss the structure and biochemical functions of pyrimidine nucleotides	
• Name the different types of pyrimidine	
• Discuss the process of pyrimidine synthesis and degradation	
• Discuss the biochemical abnormalities related to pyrimidine synthesis (e.g. Orotic aciduria)	
9. Water, electrolytes and pH disturbances	Tutorial
• Discuss the clinical importance of water, electrolytes and pH disturbances	
• Correlate the interpretation of laboratory investigations with relevant clinical conditions	

10. Nucleotide Metabolism	
• Discuss the clinical importance of Nucleotide metabolism (e.g. Gout)	
• Correlate the interpretation of laboratory investigations with relevant clinical conditions	
11. Detection of normal and abnormal urine constituents	Practical
• List the normal and abnormal urine constituents and its biochemical significance	
• Outline the method for detection of normal and abnormal urine constituents by chemical tests and urine dipstick	
• Detect the normal and abnormal constituents of urine by chemical tests and urine dipstick	
• Correlate the interpretation of laboratory investigations with relevant clinical conditions	
12. Urea & Creatinine estimation	
• Explain the bio-techniques to estimate Urea and Creatinine in a sample	
• Explain the principle of detection of Urea and Creatinine by spectrophotometry	
• Estimate Urea and Creatinine levels by spectrophotometry	
• Correlate the interpretation of laboratory investigations with relevant clinical conditions	
13. Uric Acid estimation	
• Explain the bio-techniques to estimate Uric acid in a sample	
• Explain the principle of detection of Uric acid by spectrophotometry	
• Estimate Uric acid level by spectrophotometry	
• Correlate the interpretation of laboratory investigations with relevant clinical conditions	

COMMUNITY MEDICINE

OBJECTIVES	LEARNING STRATEGY
Etiological factors & Prevention of Renal diseases	Interactive Lecture
• List the etiological factors associated with renal diseases	
• Discuss the various measures necessary for the prevention of kidney diseases	

MEDICINE

OBJECTIVES	LEARNING STRATEGY
Fluid Resuscitation (colloids & Crystalloids)	Interactive Lecture
• Explain the effect of using colloids versus crystalloids in patient's requiring fluid volume replacement	

MICROBIOLOGY

OBJECTIVES	LEARNING STRATEGY
Urinary Tract Infections	Interactive Lecture
• Explain the laboratory diagnosis of urinary tract infections	

NEPHROLOGY

OBJECTIVES	LEARNING STRATEGY
Acute Renal Failure	Interactive Lecture
• Recognize the three main categories of acute kidney injury:	
✓ Pre-renal	
✓ Intrinsic renal	
✓ Post-renal	
• Discuss the diagnostic approach of acute kidney injury	
• Describe the management of acute kidney injury	
Chronic Renal Failure	
• Define chronic kidney disease	
• Explain the etiology & pathophysiology of chronic kidney disease	
• Describe the clinical findings of chronic kidney disease.	
• Discuss treatment of chronic kidney disease	
Dialysis types & importance	
• Define dialysis	
• Discuss the purpose of dialysis	
• List the types of dialysis.	
• Explain the principles of dialysis	

PATHOLOGY

OBJECTIVES	LEARNING STRATEGY
Glomerular disorders	Interactive Lecture
• List the glomerular disorders	
• Explain the briefly pathogenesis and pathphysiology of glomerular disorders	
Renal Tubular disorders	
• List the various syndromes associated with tubular defects	
• Explain briefly pathogenesis and pathphysiology of various syndromes	
Pyelonephritis	
• Explain acute pyelonephritis.	
• Describe chronic pyelonephritis.	
Obstructive Nephropathy	
• Identify the etiology of obstructive uropathy related medical conditions and emergencies	

PHARMACOLOGY

OBJECTIVES	LEARNING STRATEGY
Diuretics	Interactive Lecture
• List the types of diuretics	
• Explain mechanism of action of and site of tubular action of diuretics	

PHYSIOLOGY

OBJECTIVES	LEARNING STRATEGY
1. General functions of kidneys and excretory system	Interactive Lecture/ Small Group Discussion
• List the general functions of kidneys	
• Describe the structure, functions and types of typical nephron and its blood supply.	
2. Glomerular filtration rate (GFR) and its regulating factors	
• Define glomerular filtration rate	
• Explain the composition of glomerular filtrate	
• Discuss the major factors that regulate the GFR (Net filtration pressure, hydrostatic, and colloid osmotic pressures)	
3. Auto-regulation of GFR and renal blood flow	
• Define tubulo glomerular feedback	
• Explain the functions of juxta glomerular apparatus and Macula densa	
• Discuss myogenic auto-regulation	
4. Tubular reabsorption and secretion	
• Discuss the transport mechanisms among different segments of renal tubule	
• Explain the regulation of tubular reabsorption and secretion	
• Discuss the hormonal control of tubular reabsorption secretion	
5. Concentration and dilution of urine	
• Explain counter current multiplier, and counter current exchange method	
• Discuss the role of urea in urine formation	
• Define obligatory urine volume	
6. Acidification of urine	Interactive Lecture
• Discuss different buffer systems in the body (bicarbonate, phosphate, ammonia)	
• Explain the role of kidneys in acid base balance	
• Discuss the changes in the level of urine PH (maximum/minimum level; 4.5-8)	

7. Process of micturition and micturition reflex	Interactive Lecture/ Small Group Discussion
• Explain physiology and innervation of bladder	
• Explain micturition reflex	
8. Plasma clearance and estimation of renal function	Interactive Lecture
• Determine renal plasma flow, renal blood, GFR	
• List the substances that are used to estimate renal function (PAH, inulin)	
• Calculate clearance of PAH and inulin	
9. Renal Hormones	
• Explain the effects of different hormones on kidney function (erythropoietin, ADH, Angiotensin, aldosterone)	
10. Overview of Transport mechanisms	
• List the various types of transport across the cell membrane.	
• Explain the active and passive transport mechanisms along with examples..	
11. Renal signs & symptoms	
• Explain the following:	
✓ Blood in urine	
✓ Protein in urine	
✓ Kidney stones	
✓ Acute kidney injury	
✓ Kidney infection	
✓ Kidney pain	
12. Edema	
• Define edema along with its types.	
• Explain the causes of intracellular and extracellular edema.	
13. Diabetic Nephropathy	Case-Based Learning
• Define diabetic nephropathy	
• List the signs & symptoms of diabetic nephropathy	
• Discuss the workup of diabetic nephropathy	
• Explain the treatment of diabetic nephropathy	

RADIOLOGY

OBJECTIVES	LEARNING STRATEGY
Radiological & imaging techniques of urinary tract	Small Group Discussion/ Practical
• Explain the radiographs and other imaging techniques of urinary system	
• Discuss the images of urinary tract	

RESEARCH & SKILLS DEVELOPMENT CENTER

OBJECTIVES	LEARNING STRATEGY
Urinary catheterization	Small Group Discussion/ Practical
• Perform Foleys catheterization on a manikin using correct aseptic techniques	

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	**TEXTBOOKS** 1. Harper's Illustrated Biochemistry 2. Lehninger Principle of Biochemistry 3. Biochemistry by Devlin
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 and Levy Physiology 5. Best and Taylor Physiological Basis of Medical Practice **B. REFERENCE BOOKS** 1. Guyton and 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:

<table>
<tr><th>WEEKS</th><th>2nd YEAR</th><th>MONTH</th></tr>
<tr><td rowspan="3">WEEK 1-4</td><td rowspan="3">RENAL & EXCREATORY MODULE</td><td>26th September 2022</td></tr>
<tr><td></td></tr>
<tr><td>20th October 2022</td></tr>
<tr><td colspan="3">PRE-PROF EXAM
10th to 12th November, 2022</td></tr>
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