



# **RAI FOUNDATION MEDICAL COLLEGE RENAL - I MODULE**

**SECOND YEAR MBBS, ACADEMIC SESSION 2025-26**

**BLOCK: IV (RENAL- I)  
Academic Year: 2025  
Duration: 4 Weeks**



## **DISCLAIMER**

- Developing a study guide is a dynamic process and undergoes iteration according to the needs and priorities.
- This study guide is subjected to the change and modification over the whole academic year.
- However, students are advised to use it as a guide for respective modules.
- It is to declare that the learning objectives (general and specific) and the distribution of assessment tools (both theory and practical) are obtained from RAI FOUNDATION MEDICAL COLLEGE, Sargodha. These can be obtained from: <https://www.uhs.edu.pk/>
- The time tables are for guiding purpose. It is to advise that final timetables are always displayed over the notice boards of each lecture hall.
- Students are encouraged to provide feedback via module coordinator.

## **Vision Statement**

To be an institution of excellence in medical education, research, and patient care, fostering innovation, compassion, and a profound commitment to addressing healthcare challenges at local and global levels.

## **Mission Statement**

We are dedicated to producing competent, ethical medical graduates who exemplify empathy, social accountability, and excellence in patient care. Through innovative education and critical thinking, they will advance clinical practice, scientific research, and lifelong learning to meet local and global healthcare needs.

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## Module Committee

Sr.no	Name	Department	Role
1.		Principal	
2.		DME	Director
3.		DME	Assistant Director
4.		DME	Senior Demonstrator
Module Team			
5.		Professor Physiology	Block Coordinator
6.		Asst. Prof. Biochemistry	Module Coordinator
7.		Asst Professor DME	Module Developer
8.		Senior Demonstrator	Module Developer
9.		Professor Anatomy	Member
10.		HOD Biochemistry	Member
11.		HOD Anatomy	Member
12.		Asso. Prof. Physiology	Member
13.		Asst Professor Pathology	Member
14.		Asst.Prof. Pharmacology	Member
15.		Professor Urology	Member
16.		Professor Medicine	Member
17.		Senior Lecturer Community Medicine	Member
16.		Asst. Prof. Psychiatry (Behavioral Science)	Member

## **Introduction to Study Guide**

It is an aid to Inform students how student learning program of the module has been organized, to help students organize and manage their studies throughout the module and 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.

### **Module Outcomes:**

- 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 on the student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's performance.

### **Achievement of Objectives:**

- Focuses on information pertaining to examination policy, rules and regulations.

***Students will experience an integrated curriculum.***

### **Integrated Curriculum:**

An integrated curriculum is all about making connections, whether to real life or across the disciplines, about skills or about knowledge. An integrated curriculum fuses subject areas, experiences, and real-life knowledge together to make a more fulfilling and tangible learning environment for students. 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.

## Marks Distribution

BLOCK IV – GIT & NUTRITION I + RENAL MODULE					
<b>Theory</b>	Part I - MCQs	85 Marks	<b>Practical</b>	OSPE	56 Marks
	Part II- SEQs	35 Marks		OSCE	16 Marks
	Internal Assessment	30 Marks		OSVE	48 Marks
	Total	150 Marks		Internal Assessment	30 Marks
				Total	150 Marks

Theme	Subject	MCQ (1 Mark)	SEQ (5Mark each)	Marks	Oral / Practical / Clinical Exam			
					OSPE (08 Marks each)	OSCE (10 Marks each)	Structure d OSVE (16 Marks each)	Marks
<b>Normal Structure</b>	Anatomy & Applied / Clinical	20	3	35	3	-	1	<b>40</b>
<b>Normal Function</b>	Physiology & Applied / Clinical	22	2	32	2	-	1	<b>32</b>
	Biochemistry & Applied / Clinical	22	2	32	2	-	1	<b>32</b>
<b>Disease Burden &amp; Prevention</b>	Community Medicine Public Health	05	-	05	-	-	-	-
	Behavioral Sciences	05	-	05	-	-	-	-
<b>Pathophysiology &amp; Pharmacotherapeutics</b>	Pathology	06	-	06	-	-	-	-
	Pharmacology	05	-	05	-	-	-	-
<b>CFRC</b>	CFRC 2-1	-	-	-	-	1	-	<b>08</b>
<b>PERLS</b>	PERLS 2-1	-	-	-	-	1	-	<b>08</b>
		<b>85</b>	<b>7×5 = 35</b>	<b>120</b>	<b>08×7 = 56</b>	<b>2×08 = 16</b>	<b>3 × 16= 48</b>	<b>120</b>

## Organization of Module

### INTRODUCTION

The renal module for second-year MBBS (Bachelor of Medicine, Bachelor of Surgery) students is a crucial component of the medical curriculum. This module is designed to provide students with a comprehensive understanding of the structure, function, and pathology of the kidneys, as well as the principles of renal physiology and the clinical management of and electrolyte balance, Acid-base balance, and blood pressure. Understanding renal physiology is essential for comprehending various disease renal disorders.

This study guide has been developed to help guide you and keep you focused on the objectives for this module.

*Welcome to the field of medicine and hope that the journey ahead will be exciting and fulfilling for you all!!*

### Teaching and learning strategies:

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

1. Interactive Lectures
2. Hospital / Clinic visits
3. Small Group Discussion
4. Practical
5. Skills session in skill labs
6. Case-Based Learning (tutorials)
7. Directed Self-Learning

- **Interactive lectures:**

An interactive lecture is an easy way for instructors to intellectually engage and involve students as active participants in a lecture - based class of any size.

- **Hospital / Clinic 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 (SGD):**

Students learn from each other. Everyone gets more practice at expressing their ideas. A two-way discussion is almost always more creative than individual thoughts. Social skills are practiced in a 'safe' environment e.g. tolerance, cooperation.

- **Skills session:**

Skills relevant to respective module are observed and practiced where applicable in skills laboratory or Laboratories of various departments.

- **Case Based Learning (CBL):**

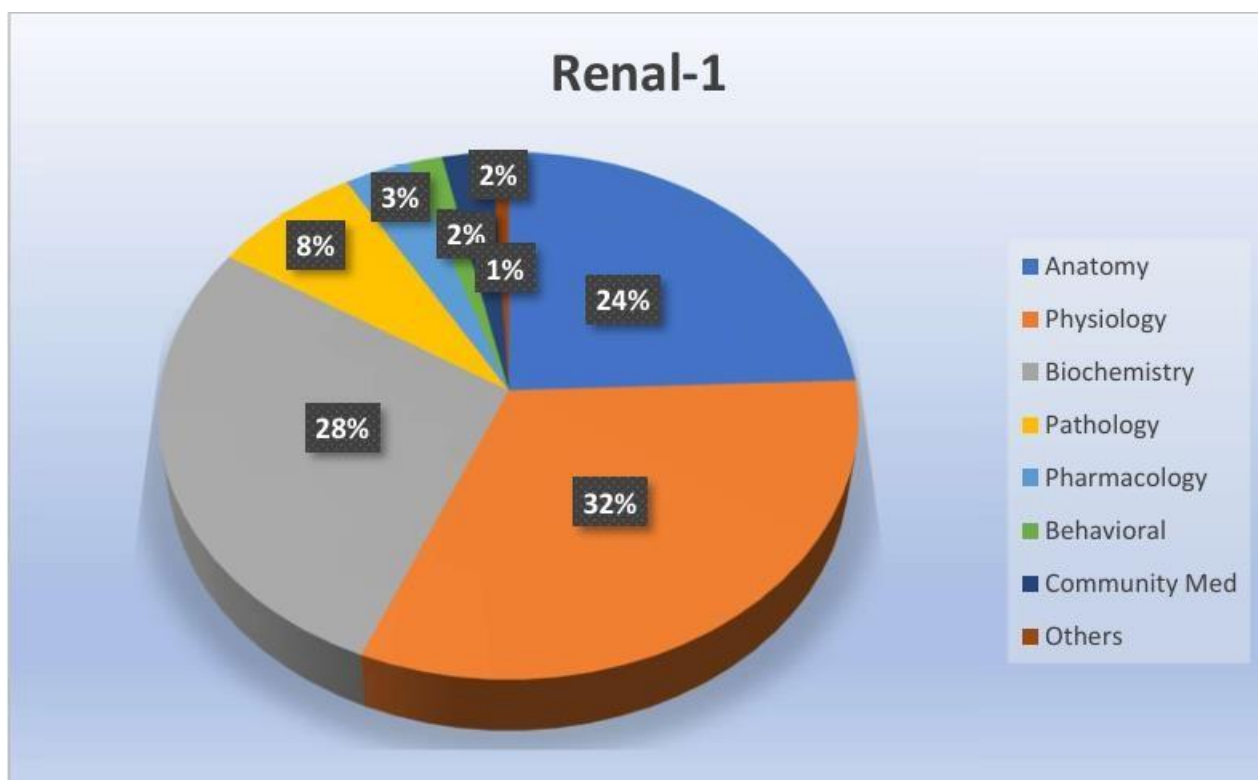
A small group discussion format where learning is focused on a series of questions based on a clinical scenario. Students discuss and answer the questions by applying relevant knowledge gained previously in clinical and basic health sciences during the module and construct new

knowledge. The CBD will be provided by the concerned department. It is an active learning & teaching strategy which promotes application of foundational knowledge in relevant clinical scenarios.

- **Directed Self-learning (DSL):**

Directed Self-learning, which involves studying with indirect supervision in a classroom/Library, is a valuable way to learn and is quickly growing in popularity among parents and students. Students' assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Centre, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

### Integrating Disciplines of Renal I Module



## **Module Outcomes**

By the end of Renal I module, students of 2<sup>nd</sup> year MBBS will be able to

- Discuss the gross and microscopic anatomy of kidney and urinary system.
  - Explain the embryological development of kidney and urinary tract.
  - Explain common developmental abnormalities of renal system.
  - Identify role of renal system in maintaining blood pressure and acid base balance.
  - Enlist functions of kidney and pathologies related to them.
  - Explain method of electrolyte balance and pathologies related to it.
  - Highlight pathologies related to kidneys and their distinctive clinical features.
  - Interpret investigations done to diagnose abnormal structural and functional presentations.
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## Themes of Renal I Module

S. No	Theme	Duration
1.	Kidneys	1 week
2.	Ureter & Bladder	1 week
3.	Disorders of Urinary System	1 week
4.	Acid Base Balance	1 week

## Specific Learning Objectives

<b>ANATOMY</b>				
<b>GROSS ANATOMY</b>				
<b>Topic</b>	<b>Specific Learning objectives</b>	<b>Teaching strategy</b>	<b>Levels C/P/A</b>	<b>Assessment</b>
<b>Kidneys</b>	Describe gross features and facial coverings of kidneys.	SGD (Dissection Hall & Museum)	C2	MCQs, SEQs, OSVE, OSPE
	Compare and contrast the relations of right and left kidneys.		C2	
	Describe blood supply, lymphatics and nerve supply of kidney.		C2	
	Discuss the clinical aspects of kidneys.		C2	
	Demonstrate the surface marking and radiographic anatomy of kidney.		C2 /P	
	Identify the side of kidney.		C2 /P	
<b>Ureter</b>	Compare and contrast the relations of right and left ureter.	SGD (Dissection Hall & Museum)	C2	MCQs, SEQs, OSVE, OSPE
	Give the constrictions of ureter.		C2	
	Describe the blood supply nerve supply and lymphatics of ureter.		C2	
	Identify the ureter		C2	
<b>Esophagus</b>	Describe the gross anatomical features, relations, surfaces, blood supply, nerve supply and lymphatics of urinary bladder.	SGD (Dissection Hall & Museum)	C2	MCQs, SEQs, OSVE, OSPE
	Give the clinical correlates of urinary bladder		C3	
	Identify the gross features and surfaces of urinary bladder.		C2	
<b>Urethra</b>	Describe the parts of urethra.	SGD (Dissection Hall & Museum)	C2	MCQs, SEQs, OSVE, OSPE
<b>Urinary Retention</b>	Interpret basic urological signs/symptoms & investigations		C2	
	Describe the etiology, and management of urinary retention.		C3	
<b>Radiograph</b>	Identify and describe the various anatomic landmarks of the renal system on radiographs.	SGD (Dissection Hall & Museum)	C2 /P	MCQs, SEQs, OSVE, OSPE
<b>EMBRYOLOGY &amp; POST- NATAL DEVELOPMENT</b>				
<b>Topic</b>	<b>Specific Learning objectives</b>	<b>Teaching strategy</b>	<b>Levels C/P/A</b>	<b>Assessment</b>
<b>Development of Urinary System</b>	Describe development of intermediate mesoderm and its derivatives.	LGIS	C2	MCQs, SEQs, OSVE, OSPE
	Describe the development of pronephros, mesonephros and metanephros.		C2	
	Describe positional changes during descent of kidney with correlation to its		C2	

	blood supply.			
	Describe the development of urinary bladder and urethra.		C2	
	List and describe the common congenital anomalies of kidney, urinary bladder and urethra.		C1 / 2	
	Identify the parts of the developing foregut, midgut and hindgut originating from the endoderm.		C2	

**MICROSCOPIC ANATOMY (HISTOLOGY)**

Topic	Specific Learning objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Structure of kidney</b>	Describe the histological, structural organization and functions of kidney with clinical.	LGIS	C2	MCQs, SEQs, OSVE, OSPE
<b>Juxtaglomerular apparatus</b>	Describe the light and ultrastructure of Juxtaglomerular apparatus and glomerular filtration barrier.	LGIS	C2	
<b>Structure of ureter</b>	Describe the histological structure of ureter.	LGIS	C2	
<b>Structure of urinary bladder</b>	Describe the histological structure of urinary bladder.	LGIS	C2	
	Discuss clinical correlates (Cystitis, Urinary bladder cancer, Urinary Tract Infections (UTIs).		C3	

**HISTOLOGY (Practical)**

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Kidney</b>	Identify and draw and label the histological structure of kidney and enumerate points of identification	Practical	C2 / P	Integrated OSPE
<b>Ureter</b>	Identify, draw and label the histological structure of ureter and enumerate its points of identification	Practical	C2 / P	
<b>Urinary bladder</b>	Identify, draw and label the histological structure of urinary bladder and enumerate its points of identification	Practical	C2 / P	

**PHYSIOLOGY**

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>The body fluid compartments &amp; edema</b>	Describe major composition of intracellular and extracellular fluids	LGIS	C2	MCQs, SEQs, OSVE, OSPE
	Define Hypo and hypernatremia		C1	
	Explain the causes of hypo & hypernatremia and their effects on composition of body fluid compartments		C2	
	Describe difference between iso-osmotic, hyperosmotic, hypo-osmotic fluids		C2	
	Enumerate causes of Intracellular and		C1	

	extracellular edema			
	Describe safety factors that prevent edema		C2	
<b>Renal Functions</b>	Explain the functions of the kidney	SGD	C2	MCQs, SEQs, OSVE
<b>Micturition Reflex</b>	Describe the mechanism of micturition and its control		C1	
	Explain the role of higher center on micturition		C2	
	Explain the physiological anatomy and innervation of bladder	LGIS	C2	
	Discuss the voluntary control of micturition		C2	
	Explain the causes, pathophysiology, and features of atonic bladder.	CBL	C2	
	Discuss the causes, pathophysiology, and features of automatic bladder.		C2	
	Document the causes, pathophysiology, and features of uninhibited neurogenic bladder		C2	
<b>Urine Formation</b>	Enlist the steps of urine formation	LGIS	C1	MCQs, SEQs, OSVE
	Explain the physiological anatomy and functions of glomerular capillary membrane		C2	
	Discuss the composition of filtrate		C2	
	Explain the minimal change nephropathy and increase permeability to plasma protein		C2 / C3	
<b>Glomerular Filtration Rate</b>	Define Glomerular Filtration Rate (GFR).	LGIS	C1	MCQs, SEQs, OSVE
	Describe the determinants of GFR		C2	
	Explain the factors affecting GFR		C2	
	Discuss the hormones and autocooids that affect GFR		C2	
	Explain mechanisms of autoregulation of GFR		C2	
	Enlist the physiological and pathological factors that decrease GFR		C1	
	Explain the effects of angiotensin II blocker on GFR during renal hypoperfusion		C2 / C3	
<b>Reabsorption</b>	Enumerate different types of transport along the kidney tubules for reabsorption	SGD	C1	MCQs, SEQs, OSVE, OSPE
	Explain the reabsorption and secretion along different parts of the Nephron		C2	
	Explain the regulation of tubular reabsorption	LGIS	C2	
	Discuss the forces / pressure and hormones that determine renal tubular reabsorption		C2	

	Explain the reabsorption of water along different parts of nephron	LGIS	C2	
	Define obligatory and facultative reabsorption		C1	
	Discuss the characteristics of late distal tubules and cortical collecting ducts	SGD	C2	
	Discuss the characteristics of medullary collecting ducts		C2	
	Describe mechanism of re-absorption of sodium along different parts nephrons		C2	
<b>Clearance</b>	Explain the use of clearance method to quantify kidney function		C1	MCQs, SEQs, OSVE, OSPE
<b>Transport Maximum</b>	Define and explain the term Transport maximum for the substances	LGIS	C1	
	Define filtered load for the substance		C1	
	Justify the difference of transport maximum and renal threshold of glucose in renal tubules			
<b>Urine Concentration &amp; Dilution</b>	Explain the renal mechanisms for excreting Dilute urine		C2	
	Explain the mechanism for forming a concentrated urine		C2	
	Discuss the role of urea in the process of counter current multiplier mechanism		C2	
	Describe the countercurrent exchange in vasa recta to preserve hyperosmolarity of renal medulla	LGIS	C2	
<b>Obligatory Urine Volume</b>	Define and explain the term obligatory urine volume		C1 / C2	MCQs, SEQs, OSVE
	Define and explain free water clearance.		C1	
<b>Disorders Of Urine Concentrating Ability</b>	Enumerate different abnormalities of urinary concentrating ability	LGIS	C1	MCQs, SEQs, OSVE, OSPE
	Enumerate the types of Diabetes insipidus	CBL	C1	
	Enlist the features of diabetes insipidus		C1	
	Explain the pathophysiology and treatment of central diabetes insipidus		C2	
	Discuss the pathophysiology of Nephrogenic Diabetes Insipidus		C2	
<b>Osmoreceptor-ADH feedback system</b>	Make the flow chart to show the Osmoreceptor antidiuretic hormone (ADH) feedback mechanism for regulating extracellular fluid osmolarity in response to a water deficit.	LGIS	C2	MCQs, SEQs, OSVE, OSPE
	Enlist the factors which increase and decrease the release of ADH		C1	
	Explain the mechanism of thirst		C2	
<b>Renal Regulation of Potassium</b>	Enumerate the factors that can alter potassium distribution between intracellular and extracellular fluids	LGIS	C1	MCQs, SEQs, OSVE

	Discuss the process of secretion of potassium by renal tubules		C2	
	Explain the regulation of internal potassium distribution and potassium secretion		C2	
<b>Control of ECF Volume &amp; Osmolarity</b>	Explain the control of extracellular fluid osmolarity and sodium concentration	LGIS	C2	MCQs, SEQs, OSVE
	Explain the integration of renal mechanism for control of Extracellular Fluid (ECF)		C2	
	Explain the importance of pressure natriuresis and diuresis in maintaining body sodium and fluid balance.		C2	
<b>Renal regulation of Calcium &amp; phosphate</b>	Explain the renal handling of calcium concentration to regulate plasma calcium concentration.	LGIS	C2	MCQs, SEQs, OSVE
	Enumerate the factors that alter renal calcium excretion.		C1	
	Enlist the factors that alter renal phosphate excretion.		C1	
<b>Renal Body Fluid Control</b>	Explain the nervous and hormonal factors that increase the effectiveness of renal body fluid feedback control.	LGIS	C2	MCQs, SEQs, OSVE
	Explain the conditions that cause large increase in blood volume and ECF volume.		C2	
	Explain the conditions that cause large increase ECF volume but with normal blood volume.		C2	
<b>Acid Base Balance</b>	Explain the renal handling of H <sup>+</sup> ion.	LGIS	C2	MCQs, SEQs, OSVE, OSPE
	Analyze the acid base disturbances on the basis of pH, HCO <sub>3</sub> and CO <sub>2</sub> .		C3	
	Explain the causes and compensation of metabolic acidosis.		C2	
	Explain the causes and compensation of metabolic alkalosis.	SGD	C2	
	Explain the causes and compensation of respiratory acidosis.		C2	
	Explain the causes and compensation of respiratory alkalosis.	LGIS	C2	
	Explain the causes and compensation of mixed acid base disorder.		C2	
	Define and explain anion gap.		C1/ C2	
<b>PRACTICAL</b>				
<b>Topic</b>	<b>Specific Learning Objectives</b>	<b>Teaching strategy</b>	<b>Levels C/P/A</b>	<b>Assessment</b>
<b>Interpretation of Report</b>	Perform a complete examination of the urine sample URS-10 (using urine reagent-10) and interpret its report	Lab	C2 / P	OSPE, OSCE
	Determine the specific gravity of urine		C2 / P	

BIOCHEMISTRY				
Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Protein digestion and absorption, reabsorption, and related disorders</b>	Describe digestion and absorption of dietary proteins along with the inherited and acquired disorders (peptic ulcer, Hartnup's disease, gluten enteropathy and cystic fibrosis).	LGIS / SGD	C2 / C3	MCQs, SEQs, OSVE
	Elaborate the mechanisms involved in renal reabsorption of amino acids and discuss related disorders (Hartnup disease and cystinuria)		C2 / C3	
<b>Protein Metabolism/ Protein degradation and turnover</b>	Clearly differentiate between protein digestion and degradation.	LGIS / SGD	C2	MCQs, SEQs, OSVE
	Compare the salient feature of the two major mechanisms for degradation of body proteins.		C2	
	Elaborate the concept of protein turnover and quote examples of short lived and long-lived proteins		C2	
<b>Amino Acid Pool</b>	Define amino acid pool.	LGIS	C1	
	Delineate the sources and fates of amino acids.		C2	
	Define nitrogen balance and explain its three states.		C1 / C2	
	Give physiological and/or pathological conditions associated with each state of nitrogen balance.		C2 / C3	
<b>Amino Acid Metabolism</b>	Enlist 7 important reactions involved in amino acid metabolism (Deamination, Transamination, Trans-deamination, Deamidation, Decarboxylation, Transmethylation & Transpeptidation).	LGIS / SGD	C1/C2	MCQs, SEQs, OSVE
<b>Trans-amination</b>	Define transamination.	LGIS / SGD	C1	MCQs, SEQs, OSVE
	Describe the reactions catalyzed by ALT (alanine transaminase) and AST (aspartate aminotransferase) with special reference to the role of pyridoxal phosphate in the transfer of amino group.		C2	
	Give diagnostic and prognostic importance of serum ALT and AST.		C2/ C3	
	Elaborate the importance of transamination reaction in amino acid metabolism.		C2	
<b>Deamidation</b>	Define deamination.	LGIS	C1	MCQs, SEQs, OSVE
	Describe the reaction catalyzed by glutamate dehydrogenase (GDH) along with its significance.		C2	
	Describe deamidation reaction catalyzed by glutaminase and asparaginase along with their significance	LGIS / SGD	C2	MCQs, SEQs, OSVE

	Explain role of L-asparaginase in the management of certain types of leukemia.		C3	
	Elaborate the mechanism for shunting of glutamine from liver to kidneys during acidosis.		C2	
	Give advantages of shunting.		C1	
<b>Trans-deamination</b>	Define trans-deamination		C1	
<b>Decarboxylation</b>	Define decarboxylation.		C1	MCQs, SEQs,
	Describe important decarboxylation reactions along with their significance		C2	OSVE
<b>Sources and transport of ammonia</b>	Give sources of ammonia in human body.	LGIS / SGD	C2	MCQs, SEQs, OSVE
	Describe how ammonia is transported to liver with special reference to the role of glutamine and alanine in this transport mechanism.		C2	
<b>Urea cycle, Ammonia Intoxication &amp; its Management</b>	Elaborate the reactions and regulation of urea cycle.		C1	
	Enlist the inherited and acquired causes of hyperammonemia in each condition.		C1	
	Give the biochemical mechanisms underlying ammonia intoxication.		C2	
	Discuss dietary and therapeutic measures for the management of patients with hyperammonemia (phenylbutyrate, lactulose, antibiotics).		C2	
<b>Biosynthesis of NEAA</b>	Trace the pathways for synthesis of non-essential amino acids (NEAA) (alanine, aspartate, glutamate, glutamine, asparagine, proline, serine, glycine, cysteine, and tyrosine)	LGIS / SGD	C2	MCQs, SEQs, OSVE
<b>Degradation of carbon skeleton of amino acids</b>	Discuss the fate of carbon skeletons of amino acids.			
	Categorize amino acids into glucogenic, ketogenic or both depending upon the intermediates produced during their catabolism.		C2	
	Outline the catabolic pathways of amino acids that yield oxaloacetate.		C1	
	Outline the catabolic pathways of amino acids that yield $\alpha$ -ketoglutarate.	LGIS / SGD	C1	MCQs, SEQs, OSVE
	Outline the catabolic pathways of amino acids that yield pyruvate.		C1	
	Outline the catabolic pathways of amino acids that yield fumarate.		C1	
	Outline the catabolic pathways of amino acids that yield succinyl CoA.		C1	
Outline the catabolic pathways of amino acids that yield acetyl CoA or acetoacetyl CoA.		C1		
<b>Inborn errors</b>	Describe the metabolism of methionine.	LGIS /	C2	MCQs, SEQs,

<b>of amino acid metabolism</b>	Discuss cause, key diagnostics features and management of homocystinuria.	SGD	C3	OSVE
	Describe the catabolism of branched chain amino acids.		C2	
	Discuss cause, key diagnostic features, and management of Maple Syrup Urine disease (MSUD)		C3	
	Describe the metabolism of phenylalanine.	LGIS / SGD		
	Give cause, key diagnostic features, and management of phenylketonuria (PKU)		C3	
	Describe the metabolism of tyrosine.		C2	
	Discuss the cause, key diagnostic features, and management of alkaptonuria, albinism, and type 1 tyrosinemia.		C3	
	Elaborate the synthesis of special products from glycine, tryptophan, phenylalanine, tyrosine, and methionine.		C2	
<b>Water &amp; pH</b>	Describe ionization of water and elaborate its significance.	LGIS / SGD	C1	MCQs, SEQs, OSVE
	Discuss water and electrolyte balance in health and disease.		C2	
	Define pH and describe the concept of pH scale.		C1 / C2	
	Define weak acids and conjugate base.		C1	
	Define Ka and pKa and give their significance.		C1	
<b>HH equation and its applications</b>	Describe Henderson-Hasselbach (HH) equation. (no derivation required) along with its application/use.		C2	
<b>Body Buffers</b>	Define buffers.	LGIS	C1	
	Enlist important buffers present in blood, plasma, ECF (Extra Cellular Fluid), ICF (Intra Cellular Fluid) and renal tubular fluid.		C1	
	Discuss the components of body buffers.		C1	
	Describe the mechanism of action of each buffers system.		C2	
	Elaborate the working of bicarbonate buffer and phosphate buffer.		C2	
<b>Regulation of H<sup>+</sup> Concentration</b>	Elaborate the concept of 1st, 2nd and 3rd line of defense against changes in H <sup>+</sup> ion concentration.	LGIS	C2	MCQs, SEQs, OSVE
<b>Renal mechanisms for pH regulation</b>	Elaborate the role of kidneys in the regulation of acid base balance.	LGIS / SGD	C2	MCQs, SEQs, OSVE
<b>Acid Base Disorders</b>	Classify acid base disorders.	LGIS / SGD	C2	
	Define acidosis and alkalosis.		C1	
	Enlist causes of metabolic acidosis and give its compensation.		C1/2	

	Enlist causes of respiratory acidosis and give its compensation.		C1/2	
	Enlist causes of metabolic alkalosis and give its compensation.		C1/2	
	Enlist causes of respiratory alkalosis and give its compensation.		C1/2	
	Interpret disorders metabolic and respiratory disorders of acid base balance on basis of sign, symptoms and arterial blood gas (ABG) finding	C3		
	Give biochemical explanation for tetany associated with alkalosis.	C2		

**PRACTICAL BIOCHEMISTRY**

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Interpretation of Results</b>	Estimate blood urea level and interpret your results.	Practical Lab	C2 / P	OSPE / OSVE
	Estimate serum creatinine level and interpret your results.		C2 / P	
	Compare the usefulness of blood urea and serum creatinine in assessment of renal functions.		C2 / P	
	Determination of proteins in urine by dipstick method and interpret your results.		C2 / P	
	Estimate serum acid phosphatase level and interpret your results.		C2 / P	

**Community Medicine**

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Quality of Life</b>	Discuss the significance of quality of life in disease and treatment settings.	LGIS	C2	MCQs
	Measures of health status. Disability-Adjusted Life Year (DALY) and Quality-Adjusted Life Year (QALY) Life expectancy.		C2	

**AGING**

<b>Preventive Medicine in Geriatrics</b>	To define preventive care in diseases related to urinary system(adults) Primary, secondary, and tertiary prevention.	LGIS	C2	-
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**BEHAVIORAL SCIENCE**

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Behavioral Abnormalities in patients with</b>	Identify the behavioral abnormalities caused by renal function.	LGIS	C1	MCQs
	Identify the cognitive abnormality.		C1	

<b>renal Dysfunction</b>	Describe the dangers for the patient, his family, and society.		C2	
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### MEDICINE

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Glomerulonephritis</b>	Discuss various presentations of glomerulonephritis.	LGIS	C1	MCQs
	Define nephrotic and nephritic syndrome.		C1	
	List various risk factors and outline management of glomerulonephritis.		C1	
	Define AKI (acute kidney injury) along with various risk factors and causes for AKI.		C2	
	Outline treatment strategies of AKI		C1	
<b>UTI</b>	Define UTI (Urinary Tract Infection).	LGIS	C1	MCQs
	Identify various risk factors and causes of UTI.		C2	
	Describe signs and symptoms of UTI.		C2	
	Outline management strategies.		C1	
AGING				
<b>Urinary Incontinence</b>	Define urinary incontinence & outline management strategies.	LGIS	C1	-

### PHARMACOLOGY

Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
<b>Diuretics</b>	Classify diuretics.	LGIS	C2	MCQs
	Discuss carbonic anhydrase inhibitor's mechanism of action, clinical uses, and adverse effects.	LGIS	C2	
	Describe loop diuretics their Mechanism of Action, clinical uses, and adverse effects.	LGIS	C2	
	Describe loop diuretics their Mechanism of Action, clinical uses, and adverse effects.		C2	
	Describe potassium sparing & osmotic diuretics their mechanism of action, clinical uses, and adverse effects.	LGIS	C2	

PATHOLOGY				
Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
Renal Stones	Discuss the etiology and pathogenesis of different types of stones.	LGIS	C2	MCQs
Hydronephrosis	Identify the causes, morphological aspect & outcome of hydronephrosis.		C2	
Urinary Tract Infections	Enlist common causative agents of urinary tract infections and describe pathogenesis and clinical features of common causative agents of UTI.		C1 / C2	

CLINICAL SKILLS (CSIM)				
Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
Catheterization	Detail the steps of urinary catheterization in females	Skill Lab	C2 / P	OSCE
	Detail the steps of urinary catheterization in males	Skill Lab	C2 / P	

PERLS (PROFESSIONALISM, ETHICS, RESEARCH, LEADERSHIP SKILLS)				
Topic	Specific Learning Objectives	Teaching strategy	Levels C/P/A	Assessment
Digital Citizen	Write a blog or a wiki.	Assignment	C3	OSCE
Research	Identify a topic for literature review		C2	

**Time Tables:**

The timetables for the module will be shared via WhatsApp groups and the notice boards in advance.

## Assessment Tools

Theoretical knowledge is tested by a written examination system constituted by multiple choice questions (MCQ) and SEQs. The assessment of practical knowledge involves oral, spot, or objective structured practical examinations (OSPE).

**Multiple Choice Questions (MCQ/SEQs):**

Multiple choice questions (MCQ/SEQs) are a form of assessment for which students are asked to select the best choice from a list of answers.

MCQ/SEQ consists of a stem and a set of options. The stem is usually the first part of the assessment that presents the question as a problem to be solved; the question can be an incomplete statement which requires to be completed and can include a graph, a picture or any other relevant information. The options are the possible answers that the student can choose from, with the correct answer called the key and the incorrect answers called distractors.

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 the college.

The block exam will comprise of 85 MCQ/ 7 SEQs each of 5 marks and will be compiled according to the shared blueprint.

**Short Essay Questions (SEQ)**

Short Essay questions generally ask for brief, text-based responses. They can be used to assess students' understanding of and ability to think with subject matter content, discourage guessing of answers, in-depth knowledge of concepts, and formulation of an answer.

**Objective Structured Practical or Clinical Examination (OSCE / OSPE)**

- The content may assess application of knowledge, or practical skills.
- Student will complete task in define time at one given station.
- All the students are assessed on the same content by the same examiner in the same allocated time.
- A structured examination will have observed, interactive and rest stations.
- Observed and interactive stations will be assessed by internal or external examiners.
- Rest station is a station where there is no task given, and in this time student can organize his/her thoughts.
- The Block OSPE / OSCE will be comprise of 12 examined stations. The stations will be assigned according to the shared blueprint.

**Internal Evaluation:**

Internal evaluation is a process of quality review undertaken within an institution for its own ends. Internal evaluation criteria will be shared with faculty and 20 % on internal assessment will be observed in each module.

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**Attendance Requirement:**

A minimum of 85% attendance is mandatory to sit for the examinations.

**Professional Examination:**

Criteria for appearing in Professional examination are according to rules and regulations shared by UHS which are available on their website. The criteria is;

- At least 85 % cumulative attendance in all blocks.
  - An average 50 % minimum score in all blocks
  - Certificate of good conduct from college
  - Certificate of having appeared in all block exams conducted by the college
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## Learning Resources for Students

### **Anatomy**

- Snell Clinical Anatomy 10<sup>th</sup> ed
- B.D Churasia
- Nelter Atlas
- Langman Embryology (12<sup>th</sup> Edi)
- Laiq Hassain Basic Histology (8<sup>th</sup> Ed)
- Difore Atlas Histology

### **Physiology**

- Guyton and Hall physiology (14<sup>th</sup> Ed)
- Essentials of Medical Physiology by Mushtaq Ahmed

### **Biochemistry**

- Harpers Illustrated Biochemistry (32<sup>nd</sup> Ed)
- Lippincott's Biochemistry
- Essentials of Medical Biochemistry vol 1&2 by Mushtaq Ahmed.

### **Community Medicine:**

- Parks Textbook of Preventive and Social Medicine. K. Park (Editor)

### **Pathology:**

- Vinary Kumar, Abul K. Abbas and Nelson Fausto Robbins and Cotran, Pathologic basis of disease. WB Saunders.

### **Pharmacology:**

- Basic and Clinical Pharmacology by Katzung, McGraw-Hill.

### **Behavioral Sciences:**

- Handbook of Behavioural Sciences by Prof. Mowadat H.Rana, 3rd Edition

Apart from these resource learning, students can consult books available in library or recommended by the specialty experts.

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