

Biochemistry Department
CMH Multan Institute of Medical Sciences (CIMS)
Multan



Students Study Guide
2nd Year MBBS
2024-25

Departmental Vision Statement

Welcome to the biochemistry lab of CMH institute of medical sciences (CIMS) Multan. Our main objective is to be recognized as a centre for excellence in **Biochemistry** that provides an atmosphere to acquire skills in identifying the link between biological and human resources and transform it to enhance the quality of life.

Vision

- To be a centre of excellence in the discipline of **biochemistry**.

Mission

- To provide quality education to the students through state of art and education in **biochemistry**.
- To provide exposure to students to the latest tools and technologies in the area of **biochemistry**.

Best Regards
Head of Department
Prof. Dr. Nakhshab Choudhry
(Biochemistry)

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Details of Faculty

SR.	NAME	DESIGNATION	QUALIFICATION
1.	Prof. Dr. Nakhshab Choudhry	HoD & Professor	MBBS,DCP, CMT, M-Phil, Ph.d (Biochemistry)
2.	Dr. Nasreen Aman	Senior Demonstrator	MBBS
3.	Dr Nawal Yousuf	Senior Demonstrator	BDS, M-Phil
4.	Dr. Sadia Akram	Demonstrator	MBBS, ICMT,CHPE.
5.	Dr Rida Irfan	Demonstrator	MBBS
6.	Dr Humna Shahid	Demonstrator	MBBS
7.	Dr Bushra Javed	Demonstrator	MBBS

Curricular Map

Module	Duration of Module	Teaching Methodology	Assessment Methodology
Foundation Module & Block 1	<u>Classes :</u> 12 weeks <u>Assessment :</u> 1 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test: (integrated)</u> Two /Three in each block <u>Class Assignment:</u> 5-10 depending upon content importance <u>Modular Examination</u> Theory, Practical, OSPE, VIVA
Block 2	<u>Classes :</u> 08 weeks <u>Assessment :</u> 1 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test: (integrated)</u> Two / three in each block <u>Class Assignment:</u> 5 -10 depending upon content importance <u>Modular Examination</u> Theory, Practical, OSPE, VIVA
Block 3	<u>Classes :</u> 11 weeks <u>Assessment :</u> 03 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test: (integrated)</u> Two / three in each module <u>Class Assignment:</u> 5- 10 depending upon each module <u>Modular Examination</u> Theory, Practical, OSPE, VIVA

BIOCHEMISTRY

BLOCK IV

Introduction		Comprehend the basic concepts of biochemistry		Lecture	Formative
Module	Topic / theme	Learning outcomes	Learning Objectives/Contents	Instructional strategies	Assessment tool
Module-VIII Digestive System & Metabolism I	1. Foundation of GIT System	Relate the basic anatomical, physiological and biochemical principles of the gastrointestinal tract (GIT) to understand GIT functions	Relate the biochemical aspects of GIT with clinical aspect	- Lectures - SGD / CBL	- MCQ - SAQ/SEQ Structured viva For example: SEQ: Write a short note on digestion and absorption of carbohydrate , lipids and proteins . MCQ: Which electrolyte is required for activation of salivary amylase? A magnesium B chloride C sodium D bicarbonate
	2. Oral cavity & Esophagus	Relate the anatomical structures, physiological functions and biochemical processes involved in oral cavity to its	Discuss the biochemical composition of saliva and its role in digestion, mechanism of regulation, daily secretion, stimulants and depressants. Clinical Relevance: Relate the hypo and hyper secretions of salivary glands with its physiological and biochemical basis	- SGD - Integrated session	- MCQs, - SEQs/ SAQs, - Structured Viva

		clinical significance			
		Relate the developmental phenomenon, anatomical structures, physiological functions and biochemical processes involved in esophagus to its clinical significance	Describe the protective biochemical mechanisms against gastric reflux. Clinical Relevance: • Discuss disorders of swallowing (dysphagia, achalasia), esophageal disorders (e.g., GERD, esophagitis, Barrett's esophagus) and their clinical presentations • Describe the anatomical basis of bleeding esophageal varices	• LGIS. • SGD • Integrated session	• MCQs, • SEQs/ SAQs, • Structured Viva
	3. Stomach	Relate the developmental events, anatomical structures, physiological functions and biochemical processes involved in stomach, to its clinical significance	Describe the composition, mechanism of synthesis, daily secretion, stimulants, depressants, factors affecting HCl secretion, and biochemical regulation of gastric secretions Describe the role of the stomach in the initial stages of protein digestion and the production of intrinsic factor for vitamin B12 absorption Clinical Relevance: • Correlate a case of gastritis with pernicious anemia with histological and biochemical basis • Explain the embryological basis of pyloric stenosis • Describe the mechanism of development of gastric ulcers and erosions • Describe the gastric functions tests • Explain gastric and peptic ulcers with reference to their common locations and blood vessels endangered as a consequence of perforation • Identify common stomach disorders such as gastritis, Helicobacter pylori infection, achlorhydria, peptic ulcer and gastric cancer	• LGIS, • SGD/CBL	• MCQs, • SEQs/ SAQs, • OSPE, • Structured viva For example; Viva questions: What are gastric function tests? Differentiate between gastric and peptic ulcers.

	4. Small intestine	Relate the anatomical structures, physiological functions and biochemical processes involved in small intestine to its clinical significance	• Explain the processes of digestion and nutrient absorption in the small intestine • Explain the role of digestive enzymes and hormones (gastrin, secretin and CCK) in the breakdown and absorption of proteins • Describe the nutritional requirement of carbohydrate • Revisit the concepts of digestion and absorption of Carbohydrates biomedical importance of carbohydrates (lactose intolerance, Glycemic Index and Glycemic load) – <i>Already taught in Year I (Glycemic Index and Glycemic load not to be assessed in Year II)</i> • Describe the nutritional requirement of Proteins • Discuss the digestion and absorption of Proteins, carbohydrates and lipids • Describe Protein turnover, amino acid Pool, Nitrogen Balance, Protein Quality • Explain the Biomedical importance of Protein (PEM) • Describe the nutritional requirement of Lipids • Discuss the digestion and absorption Lipids & Nucleic acids in human body Nutrition • Give the caloric requirements of the human body • Define Balanced Diet and elaborate various DRIs (EAR, DA, AI, UL), AMDR • Describe Protein turnover, amino acid Pool, Nitrogen Balance, BMR, BMI, Respiratory quotient, Protein Quality and Glycemic Index. • Describe the nutritional requirement and biomedical importance of CHO, lipid & protein in human body • Discuss Malnutrition with Protein Energy Malnutrition in particular, Nutritional requirements in various stages of life and Nutritional tools	• LGIS, • SGD/CBL	• MCQs, • SEQs/ SAQs, • OSPE, • Structured viva For example; SEQ: • Compare and contrast between Marasmus and Kwashiorkor. • Describe Protein turnover, amino acid Pool, Nitrogen Balance, Protein Quality • Explain the Biomedical importance of Protein (PEM)

			Elaborate obesity with respect to body weight assessment, body weight regulation, molecular influences, metabolic and health effects Clinical Relevance: • Identify common disorders of the small intestine, such as celiac disease, and small intestinal bacterial overgrowth (SIBO), Sprue • Correlate development of midgut with abnormalities of mesenteries, vitelline duct abnormalities, gut rotation defects, gut atresia & stenosis • Differentiate between omphalocele, umbilical hernia and gastroschisis on the basis of embryology • Explain the nutritional requirements in Pregnancy, cirrhosis, end stage renal disease • Compare and contrast between Marasmus and Kwashiorkor		
	5. Large Intestine	Relate the anatomical structures, physiological functions and biochemical processes involved in large intestine to its clinical significance	Protein Chemistry • Revisit protein chemistry Protein Metabolism: • Apply the knowledge of protein metabolism for understanding relevant metabolic disorders • Discuss amino acid pool, protein turnover and nitrogen balance • Outline the mechanism of Nitrogen excretion from the human body • Define and exemplify various mechanisms of transamination, deamination, decarboxylation, deamidation, mechanism of Amino acid oxidation • Describe the transport of amino group, role of Pyridoxal phosphate, Glutamate, Glutamine, Alanine • Draw Urea cycle and discuss its regulation in detail • Describe Genetic defects of Urea cycle • Explain in detail the concept of Ammonia intoxication • Comprehend Carbon skeleton metabolism and its importance	• Lectures • SGD / CBL	• MCQs, • SEQs/ SAQs, • OSPE, • Structured viva

			- Describe various metabolic fates of an amino acid and specialized products of amino acids (catecholamines, histamine, serotonin, melanin, melatonin etc) except branched chain amino acids and creatine - Describe Functions, pathways of amino acid, degradation and genetic disorders of individual amino acids except branched chain amino acids and creatine Clinical Relevance: - Identify common disorders of large intestine, such as Crohn's disease, IBS, pain lower abdomen, appendicitis, haemorrhoids/ anal fissure and intestinal obstruction - Describe the embryological basis of hindgut abnormalities (Recto anal atresia, anal fistulas, imperforate anus and congenital mega colon) - Describe the common types, pathophysiology and presentations of diarrhea and constipation	Integrated session	
	6. Liver & Biliary Tree	Relate the anatomical structures, physiological functions and biochemical processes involved in Liver and Gallbladder to its clinical significance	- Elaborate the role of liver in the metabolism of bilirubin - Elaborate the role of liver in the metabolism of proteins - Compare the role of different body organs in integration of metabolism in health and disease - Describe the composition, functions, daily secretion, stimulants and depressants of Bile juice and related disorders: Cholelithiasis & Cholecystitis) - Elaborate the role of liver in the metabolism & LFTs Clinical Relevance: Identify common disorders of the liver and gallbladder, such as fatty liver, cirrhosis, portal hypertension, cholelithiasis and cholecystitis.	•	- MCQs, - SAQs/ SEQs, - OSPE, - Structured Viva For Example ; OSPE: Name liver function tests. Viva question: - Types of jaundice - Color of bilirubin

			• Differentiate between different types of jaundice on the basis of interpretation of LFTs- To be assessed in practical		
	7. Pancreas	Relate the anatomical structures, physiological functions and biochemical processes involved in Pancreas to its clinical significance	• Describe the composition, functions, daily secretion, stimulants and depressants of Pancreatic Juice • Discuss regulatory effects of Insulin and Glucagon on CHO metabolism. • Describe the regulation of Blood Glucose in human body • Describe Feed fast cycle and explain its adaptation by different tissues to changing energy conditions of the body Clinical Relevance: Identify common disorders of the pancreas: Acute and chronic pancreatitis and Zollinger-Ellison syndrome • Justify the referred pain of acute pancreatitis with anatomical reasoning • Explain the embryological basis of Annular pancreas and accessory pancreatic tissue • Explain Hyperglycemia, hypoglycemia and their regulating factors	• LGIS • SGD/CBL	• MCQs, • SEQs/ SAQs • OSPE, • Structured Viva
Practical					
Biuret Test	Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment		• OSPE/ Practical Performance		
Ninhydrin Test	Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment		• OSPE/ Practical Performance		
Xanthoproteic Test	• Explain the principle, results, interpretation and clinical significance/diagnostic application		• OSPE/ Practical Performance		

	• Demonstrate the test using specified procedure and appropriate glassware/equipment	
Millon's Test	• Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment	• OSPE/ Practical Performance
Aldehyde Test	• Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment	• OSPE/ Practical Performance
Sulphur Test	• Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment	• OSPE/ Practical Performance
Interpretation of diet chart and calculation of BMI	• Comprehend different diet charts • Calculate BMI • Explain hazards of obesity and its prevention	• OSPE/ Practical Performance
Estimation & clinical interpretation of serum ALT, AST & ALP	• Explain the indications, pre-requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report	• OSPE/ Practical Performance

Linkers of Integrated sessions:

- Swelling in groin/inguinal hernia
- Dysphagia/ Achlasia
- Appropriate Nausea & Vomiting / Pain epigastrium/ Peptic Ulcer
- Diarrhea/ Constipation/ Abdominal distention
- Jaundice/ Cirrhosis Malnutrition

Module-IX Genitourinary System Module	1. FLUID & ELECTROLYTE BALANCE	Correlate the anatomical, physiological, and biochemical aspects of water and fluid homeostasis	Apprehend the basic concepts of Biochemistry & biomolecules • Discuss medical biochemistry of water and fluid homeostasis relating to electrolyte balance • Enumerate various types of particles and solutions about the importance of selectively permeable membrane	• LGIS , • CBLs, • SGD's, • Hands on activities, Seminars	• MCQs • SAQs/ SEQs • OSPE • Structured Viva
	2. KIDNEY		Role of kidney in metabolism:	• LGIS,	• MCQs

			• Relate the metabolic role of kidney in health and disease • Interpret RFTs • Explain biochemical basics of dialysis	• SGDs, • Hands-on activities • Seminars	• SAQs/ SEQs • OSPE • Structured Viva
			Explain the effects of adding isotonic, hypotonic and hypertonic solution (to ECF) on ICF and ECF compartments • Discuss importance of osmosis and osmotic pressure • Mention importance of surface tension viscosity and their importance in relation to body fluids	• LGIS , • CBLs, • SGDs, • Hands on activities, Seminars	• MCQs • SAQs/ SEQs • OSPE • Structured VivaS
		Relate the histological structures, physiological functions and biochemical processes involved in tubular reabsorption along different parts of nephron to its clinical significance	• Explain the distribution and biochemical functions of water	• LGIS , • CBLs, • SGDs, • Hands on activities, Seminars	• MCQs • SAQs/ SEQs • OSPE • Structured VivaS
		Relate the physiological functions and biochemical processes involved in formation of urine to its clinical significance	• Describe various types of particles and solutions in relation to the importance of membranes • Describe the importance of permeability of membranes, osmosis, osmotic pressure, surface tension, viscosity and their importance in relation to body fluids • Discuss the biochemical regulation of plasma/ECF osmolarity	• LGIS , • CBLs, • SGDs, • Hands on	• MCQs • SAQs/ SEQs • OSPE • Structured VivaS

		Relate the physiological and biochemical processes involved in regulation of different electrolytes to its clinical significance	Describe the sources, normal serum level and biochemical functions of sodium, potassium, calcium and magnesium - Discuss causes and effects of imbalance of various electrolytes Clinical relevance ♣ Identify common electrolyte abnormalities with clinical case presentation. ♣ Correlate RFTs with clinical presentation (Oliguria/ Uraemia/ Renal Failure) ♣ Describe the principles of Dialysis(Artificial kidney, Hemodialysis and peritoneal dialysis)	- LGIS , - CBLs, - SGDs, - Hands on	- MCQs - SAQs/ SEQs - OSPE - Structured VivaS
	3. ACID BASE BALANCE	Relate the physiological functions and biochemical processes involved in regulation of acid base status to its clinical significance	Describe PH metery and PH Scale Describe Ionization of water & weak acids, bases, pH pK values, pH scale, Dissociation constant & titration curve of weak acids Describe application of Henderson -Hassel Balch equation Explain the mechanism of chemical and physiological buffering and homeostasis. Clinical Relevance: - Correlate the presentation of different acid base disorders with their etiology - Interpret person's acid base status through ABGs analysis - Describe anion gap and its clinical significance	- LGIS , - CBLs, - SGDs, - Hands on activities - Integrated sessions	- MCQs - SAQs/ SEQs - OSPE - Structured VivaS
PRACTICALS					
Practical	Learning Outcomes			Assessment Strategies	
Physical and microscopic analysis of urine	- Explain the principle, results, interpretation and clinical significance/diagnostic application - Calculate the specific gravity of urine sample using specified procedure and appropriate glassware/equipment			OSPE	

Chemical analysis of urine: Ehrlich's test, Rothera's test, Heat coagulation test, Sulfosalicylic acid	• Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment	OSPE/ Practical Performance
Interpretation of urine report	Explain the different components of urine report • Interpret laboratory reports of clinical conditions (UTI, diabetic ketoacidosis, diabetes mellitus, nephrotic syndrome, phenylketonuria, bladder cancer, pre-eclampsia)	OSPE
Demonstrate the working and application of pH metery	• Explain the principle, results, interpretation and clinical significance/diagnostic application • Demonstrate the test using specified procedure and appropriate glassware/equipment	OSPE/ Practical Performance
Interpretation of ABGs	• Explain the indications, pre-requisites, principle, results and clinical significance/diagnostic application • Interpret laboratory report	OSPE

Linkers of Integrated sessions:

1. Edema/ Dehydration
2. Pain in right flank
3. Polyuria
4. Oliguria
5. Acid base disorders
6. Uterine prolapse
7. Hemorrhoids

Block –V

Module	Topic/Theme	Learning Outcomes	Teaching & Learning Strategies	Assessment tool
MODULE X Neurosciences I & Genetics	1. Foundations of Neurosciences Apply the basic anatomical and physiological	• Discuss synthesis, stimulus, mechanism of action and biochemical role of neurotransmitters Clinical Relevance: • Analyze the pathophysiology of demyelinating	• Lectures • SGD/ CBL	• MCQs, • SEQs/ SAQs • OSPE, • Structured Viva

	principles of common neurological processes by correlating the structures forming the nervous system with their functions. Interpret the physiological mechanisms controlling the neuronal signals transmitting through synapse Interpret the physiological mechanisms controlling the functions of sensory system	disorders like Multiple sclerosis. • Differentiate between tetanization, tetany, tetanus and treppe • Justify and correlate the role of different neurotransmitters in various Neurological & Immunological disorders		
	2.Nucleotide Chemistry Apply the knowledge of Nucleotide Chemistry in understanding genetic disorders, cancers, and developing anti-viral drugs and advanced gene therapy	♣ Describe nitrogenous bases, nucleosides, nucleotides and nucleic acids, their types, structure, and functions ♣ Discuss the synthetic derivatives of purines, pyrimidines and nucleotides and their role in health and disease	• Lectures • SGD/ CBL	• MCQs, • SEQs/ SAQs • OSPE, • Structured Viva
	3-Nucleotide Metabolism Apply the knowledge of	♣ Explain nucleotide metabolism for understanding relevant metabolic disorders ♣ Outline the de novo synthesis of Purine,	• Lectures • SGD/ CBL	• MCQs, • SEQs/ SAQs • OSPE,

	nucleotide metabolism for understanding relevant metabolic disorders	nucleotides and deoxyribonucleotides ♣ Explain the salvage pathway of purines and pyrimidines nucleotides ♣ Describe the degradation of purines and pyrimidines with related diseases Clinical Relevance: Relate the nucleotide metabolism with clinical disorders like gout, Lesch-Nyhan syndrome, orotic aciduria, immunodeficiencies and other metabolic disorders	• Integrated sessions	• Structured Viva
	4-Molecular Genetics Apply the knowledge of DNA, RNA and biotechnology , and their role in Genetics and molecular medicine	♣ Describe DNA structure & types of state organization of Prokaryotic and Eukaryotic DNA ♣ Describe various types of RNA and their structure ♣ Outline Prokaryotic and Eukaryotic replication, transcription and translation ♣ Explain the Supercoiling of DNA ♣ Outline the different mechanisms of regulation of gene expression and their role in various metabolic and genetic disorders ♣ Describe mutations, DNA Repair Mechanisms, Reverse transcription, post transcriptional modification, Post Translational Modification and various Genetic Diseases ♣ Relate genetics and molecular medicine in health and disease ♣ Describe PCR, different blotting techniques, RFLP, cloning , Probes, plasmids and their role in forensic, prenatal diagnosis and gene therapies Clinical Relevance: ♣ Analyze the role of DNA structure, types and eukaryotic DNA organizations in genetic testing and therapy. ♣ Justify the importance of molecular medicine, genetics and biotechnology in diagnosing and treating genetic disorders, cancers and infectious diseases. ♣ Evaluate the importance of DNA replication in	• Lectures • SGD/ CBL • Integrated sessions	• MCQs, • SEQs/ SAQs • OSPE, • Structured Viva

		prokaryotes and eukaryotes aiding in the development of antibiotics and antiviral drugs. ♣ Correlate the knowledge of mutations in diagnosing and treating genetic disorders and cancers		
LIST OF MEDICAL BIOCHEMISTRY PRACTICALS (NEUROSCIENCES & GENETICS)				
Practicals		Learning Outcomes	Assessment tool	
Collection and preservation of clinical specimens		• Explain the guidelines, criteria, method of collection of biospecimens (blood, urine, feces, saliva, sputum, tissue sample) • Explain the use of different vacutainers, their additives and application in collection and preservation of blood samples	• OSPE	
Estimation and clinical interpretation of serum uric acid		• Explain the indications, pre-requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report • Demonstrate the test using specified procedure and appropriate glassware/equipment	• OSPE • Practical Performance	
DNA extraction		• Explain principle, method and application of phenol chloroform DNA extraction method • Explain the procedure of visualization of DNA bands using Gel electrophoresis and Gel doc system	• OSPE • Practical Performance	
PCR		• Explain the principle, protocol, procedure, application, advantages and types of PCR	• OSPE	
Justify the use of solutions in clinical practice		• Explain different types of solutions and their applications in clinical practice (ORS, normal saline, dextrose, Ringer’s lactate, Heamaccel)	• OSPE	
BLOCK VI				
Module-XI Maxillofacial & Special Senses	Molecular Insights: Cancer Markers, Aging, and Xenobiotics Elaborate on the biochemical	Cancer and tumor markers KNOWLEDGE • Enumerate Tumor biomarkers and their biomedical role in screening, diagnosis and prognosis in various malignancies • Correlate tumor markers in different malignancies	• LGIS • SGD • CBL • Tutorials	MCQs SAQ/SEQ • Structured viva (Summative

	aspects of cancer	• Appraise the genetic basis of cancer • Describe the biochemical basis and hallmarks of cancer • Discuss the biochemical features of carcinogenesis • Enumerate the biochemical causes of genetic damage and genetic alterations affecting the regulation of key genes • Describe Oncogenes and tumor suppressor genes • Highlight the key role of oncogenes and tumor suppressor genes in carcinogenesis • Discuss Epigenetic mechanisms in carcinogenesis • Explain the biochemical basis of tumor metastasis • Effect of cancer on metabolism • Relation of cancer with inflammation and obesity • Measures to prevent carcinogenesis	• Student presentations	component)
		• Outline the essential feature of aging and genetic factors effecting aging • Co-relate the effect of reactive oxygen species with cell injury and aging • Enlist and explain different reactive oxygen species (ROS) produced by the human body and mechanism of their production • Explain the Effect of ROS on health and disease • Describe Mechanism of Scavenging of ROS • Explain Wear and tear theories of aging • Highlight Molecular repair mechanisms to combat wear and tear • Determine the Biochemical role of antioxidant (Vit E, Vit C, Glutathione, Lipoic acid, CoQ10 and NADPH) • Comprehend the concept of apoptosis and necrosis in aging • Rejuvenation therapies	• LGIS • SGD • CBL • Tutorials • Student presentations	MCQs SAQ/SEQ • Structured viva (Summative component)

		• Role of vitamins in special senses - Wald's visual cycle and vitamin A • Highlight the role of telomeres in cellular aging		
	Xenobiotics Elaborate the role of xenobiotics in health and disease	• Describe xenobiotics • Outline phase 1 and phase 2 reactions • Discuss biochemical properties of Cytochrome P450 and its functions with relevant clinical importance	• LGIS • SGD • CBL • Tutorials • Student presentations	- MCQs - SAQ/SEQ - Structured viva (Summative component)
List of Practicals				
Interpret the results of given examination		• Describe the Principle of ELISA and its clinical application	• Demonstration • Practical performance • OSPE	
Linkers 1. Danger areas face/ Cavernous sinus thrombosis 2. Oral cavity cancers/ lesions 3. Parotid gland swelling/ Mumps 4. Commonly occurring Cranial Nerves lesions 5. Otitis Media/ Deafness 6. Anosmia				
MODULE XII Endocrinology	1-Introduction to Endocrine glands Apply the basic anatomical, physiological,	• Classify hormones on the basis of structure, receptors and mechanism of action • Describe Cell surface receptors • Describe Intracellular second messenger signaling cascade • Explain Intracellular ligand receptor • Describe the key biochemical features of the endocrine glands concerning their specific	• LGIS, • SGD, • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva

	and biochemical principles of the Endocrine system in relevance to Endocrine functions and disease processes	secretions • Explain the key principles of the endocrine system • Intracellular traffic and sorting of proteins: • Discuss the basic concept of Golgi apparatus, cytosolic proteins and endoplasmic reticulum in performing intracellular trafficking and sorting • Eicosanoids metabolism: Comprehend introduction, biosynthesis and functions of eicosanoids		
	2. Hypothalamus and Pituitary Gland Relate the anatomical structures, physiological functions and biochemical processes involved in Hypothalamus & Pituitary gland related to its clinical significance	• Explain the structure, site of synthesis, stimulus for secretion, mechanism of action, regulation, receptors, intracellular effects, Common regulatory hormones, target cells and biochemical roles of hypothalamus in hormonal regulation of pituitary gland • Describe Hormones of Pituitary gland • Explain the structure, site of synthesis, stimulus for secretion, inhibitors, mechanism of action, mechanism of regulation, intracellular effects, target cells and biochemical role of Growth Hormone Clinical Relevance Relate the knowledge of pituitary gland and hypothalamus to understand following diseases • Panhypopituitarism/ Sheehan's Syndrome • Pituitary Adenomas • Gigantism Vs Acromegaly • Dwarfism	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva
	3. Thyroid Gland Relate the anatomical structures, physiological functions and	Explain the biochemical steps of synthesis, stimulus for secretion, mechanism of action, mechanism of regulation, intracellular effects, target cells and biochemical role of T3, T4, TSH Clinical Correlation	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva

	biochemical processes involved in thyroid gland related to its clinical significance	Correlate the pathophysiology of hypo/hyper secretion of Thyroid hormones with the clinical presentation and biochemical profile		
	4. Parathyroid Gland Relate the anatomical structures, physiological functions and biochemical processes involved in parathyroid gland related to its clinical significance	Explain the biochemical steps of synthesis, stimulus for secretion, mechanism of action, mechanism of regulation, intracellular effects, target cells and biochemical role of parathyroid hormone and calcitonin Clinical Correlation • Correlate the pathophysiology of Hypo and hyper parathyroidism with their clinical presentations and biochemical profile	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva
	5-Adrenal Glands Relate the anatomical structures, physiological functions and biochemical processes involved in adrenal gland related to its clinical significance	• Explain the site and steps of synthesis, stimulus for secretion, mechanism of action, regulation, receptors, intracellular effects, target cells, and biochemical roles of glucocorticoids (corticosteroids), mineralocorticoids (aldosterone) and androgens Clinical Correlations: Correlate the pathophysiology of Hypoadrenalism and Hyperadrenalism with its clinical presentation and biochemical profile	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva
	6-Pancreas as	Describe the structure, site of synthesis, steps of synthesis, stimulus for secretion, mechanism of	• LGIS,	• MCQs,

	Endocrine Organ Relate the anatomical structures, physiological functions and biochemical processes involved in Endocrine part of Pancreas related to its clinical significance	action, regulation, receptors, intracellular effects, target cells, tissues and biochemical role of Insulin, glucagon and somatostatins Integration and regulation of metabolic pathways in different tissues: • Discuss metabolic effects of insulin and glucagon • Discuss regulatory effects of insulin and glucagon on metabolism of carbohydrates, protein, lipids and minerals • Describe feed fast cycle and explain its adaptation by different tissues to changing energy conditions of the body • Clinical Correlation: ♣ Discuss the pathophysiology of various types of Diabetes Mellitus and associated micro and macrovascular complications ♣ Outline the treatment modalities of Diabetes Mellitus ♣ Correlate the clinical presentation of hypoglycaemia with varying levels of blood glucose	• SGD • CBL	• SAQs/ SEQs, • OSPE, • Structured Viva
	7-Male Reproductive System Relate the anatomical structures and physiological functions involved in Male Reproductive System along with their clinical significance	Explain the chemistry, steps of synthesis, stimulus for secretion, regulation, mechanism of action, receptors, intracellular effects, target cells and biochemical roles of testosterone Clinical Correlation: Correlate the pathophysiology of male infertility with hormone profile and semen analysis	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva

	8-Female Reproductive System Relate the anatomical structures and physiological functions involved in Female Reproductive System along with their clinical significance	Explain the structure, site of synthesis, steps of synthesis, stimulus for secretion, regulation, mechanism of action, receptors, intracellular effects, target cells and biochemical roles of LH, FSH, Estrogen, Progestins, placental hormones , oxytocin, Anti-mullerian hormone and Prolactin Clinical correlations: • Correlate the pathophysiology of female infertility with hormonal profile • Interpret pregnancy tests • Compare different contraceptive methods	• LGIS, • SGD • CBL	• MCQs, • SAQs/ SEQs, • OSPE, • Structured Viva
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• **LIST OF MEDICAL BIOCHEMISTRY PRACTICALS**

ELISA	• Explain the principle, procedure, types, applications and advantages of ELISA	• OSPE
Interpretation of Thyroid profile	• Explain the indications, pre requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report	• OSPE
Interpretation of OGTT	• Explain the indications, pre requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report	• OSPE
Interpretation of Sex hormones	• Explain the indications, pre requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report Estimation and clinical interpretation of serum urea	• OSPE
Estimation and clinical interpretation of serum urea	• Explain the indications, pre requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report	• OSPE/ Practical Performance

	• Demonstrate the test using specified procedure and appropriate glassware/equipment	
Estimation and clinical interpretation of serum creatinine	• Explain the indications, pre requisites, principle, results and clinical significance/diagnostic application • Interpretation of laboratory report • Demonstrate the test using specified procedure and appropriate glassware/equipment	• OSPE/ Practical Performance
Linkers of Integrated sessions: 1. Disorders of pituitary gland 2. Disorders of thyroid/ parathyroid gland 3. Diabetes Mellitus 4. Disorders of adrenal gland 5. Disorders of male/ female reproductive system		

Recommended Books

Sr.	Books
1.	Lippincott illustrated Reviews Biochemistry (8 th Edition)
2.	Harper's illustrated Biochemistry (32 nd Edition)

Reference Books

Sr.	Books
1.	Textbook of biochemistry with clinical correlations(Thomas M. Devlin)
2.	Mushtaq biochemistry (volume 1 & 2)

WEEKLY TRG PROGRAMME OF 1ST YEAR MBBS CLASS SESSION (2023-28)
CMH MULTAN INSTITUTE OF MEDICAL SCIENCES MULTAN CANTT
WEEK 01 (BLOCK -I)

DAY	0815-0905	0905-1055	0955-1015	1015-1105	1130-1225	1225-1315	1315-1345	1345-1515
MON	Physiology-1	Anatomy-1	Tea Break	Biochemsitry-1 Cell structure & Foundation-IV Dr. Nawal Yousuf	CBL/SDL Histology: A Physiology: B Biochemistry: C SDL: D	Practical Skills/SDL Histology: D Physiology: A Biochemistry: B SDL: C	LUNCH / PRAYER BREAK	DH
TUE	Anatomy-2	Physiology-2		Biochemsitry-2 Cell structure & Foundation-V Prof. Lt. Col Javad Yousaf	CBL/SDL Histology: D Physiology: A Biochemistry: B SDL: C	Practical Skills/SDL Histology: C Physiology: D Biochemistry: A SDL: B		DH
WED	Physiology-3	SDL		Biochemsitry-3 Cell structure & Foundation-VI Dr. Nawal Yousuf	CBL/SDL Histology: C Physiology: D Biochemistry: A SDL: B	Practical Skills/SDL Histology: B Physiology: C Biochemistry: D SDL: A		DH
THU	Physiology-4	Anatomy – 3		Islamiat Lt Col Nayyer Abbas (Retd)	CBL/SDL Histology: B Physiology: C Biochemistry: D SDL: A	Practical Skills/SDL Histology: A Physiology: B Biochemistry: C SDL: D		Electives
FRI	Medicine	Surgery		Physiology 5	Practical Emryology	Expository Writing (English)	LUNCH / PRAYER BREAK	Quran Class/ Research methodology

Venue – All Lectures will be delivered in Joint Lect Hall.

		Anatomy		Physiology	Biochemistry
SGD/CBL	Facilitators' Names				Dr Sadia Akram & Dr Humna Shahid
	Venue	DH, Skill lab, DH demo room		Tutorial Room 4, Lec Hall 1	Tutorial Room 1&2
	Topic				Intro to CBL and its relation & significance related to Medicine.
Practical	Facilitators' Names				Dr Rida Irfan
	Venue	Histology Lab	Embryo / Joint Lect Hall	Physiology Lab	Biochemistry Lab
	Topic				Lab Precaution Introduction to Lab Equipments

Bio/03/ CIMS _____ JAN 2024

HoD Biochemistry
(Prof Dr Nakhshab Choudhry)

To: Trg Branch-CMC