

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



Students Study Guide
1st Year MBBS
2025

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)

Introduction / Guidelines

What is a study guide?

It is an aid to:

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

The study guide:

- Informs about organization and management of the block.
- Defines the objectives which are expected to be achieved at the end of the block.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstrations, tutorials, and case-based learning that will be implemented to achieve the block objectives.
- Provides a list of learning resources such as books, computer assisted learning programs, web-links, and journals, for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous assessment and annual examinations on the student's overall performance.
- Includes information on the assessment methods.
- Focuses on information pertaining to examination policy, rules and regulations.

Organization.

The curriculum of 1st year MBBS is modular. It is organized and the content taught is integrated concurrently in themed modules. The themes form the building blocks of this curriculum. There can be vertical thread of content across more than one module for the content that does not fit into central theme of a module. In each module the sequencing of the content is subject based. Modules.

The key detail is as follows

1. There shall be three blocks in an academic year.
2. Each block consists of multiple modules.
3. The duration of three blocks shall be 10 – 16 weeks each.
4. The syllabus shall be integrated horizontally around systems of the body.
5. Additional chunks of content may be added in a module that exactly does not fit in the central theme of the module.
6. There can be vertical thread of a content across more than one module for the content that does not fit into central theme of a module
7. There shall be vertical integration to the extent decided by the medical college.

CONTACT HOURS

Total Contact Hours of Biochemistry is 125 hours

Level of integration

NUMS will follow Correlation i.e level 7 of Harden's level of Integration in first three years. The emphasis remains on disciplines or subjects with subject-based courses taking up most of the curriculum time. Within this framework, an integrated teaching session or course is introduced in addition to the subject-based teaching. This session brings together areas of interest common to each of the subjects. Though the teaching is discipline based, topics are correlated and taught with clinical context for better understanding and application of concepts.

Competencies

The focus of this curriculum is on the roles of a general physician as identified by PMC. These are skillful, knowledgeable, community health promoter, critical thinker, professional and role model, researcher and leader. Competencies focused in year are: -

- a. Medical Knowledge
- b. Procedural skills
- c. Problem solving
- d. Communication skills
- e. Professionalism
- f. Research

Outcomes

By the end of years,
1st year students should be able to:

- Correlate the developmental and anatomical knowledge of different organ systems of human body to their physiological and biochemical basis
- Communicate clearly and effectively.
- Comprehend the significance of behavioural sciences for medical students
- Discuss the attributes of professionalism
- Demonstrate understanding of significance of good leadership & Management
- Analyze multiple perspectives of Pakistan studies
- Discuss the basic principles of research

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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.	Maj. Naeema Ahmad	Assisstant Professor	MBBS, M-Phil (Biochemistry)
3.	Dr. Nasreen Aman	Senior Demonstrator	MBBS
4.	Dr Nawal Yousuf	Senior Demonstrator	BDS, M-Phil
5.	Dr. Sadia Akram	Demonstrator	MBBS, ICMT,CHPE.
6.	Dr Rida Irfan	Demonstrator	MBBS
7.	Dr Humna Shahid	Demonstrator	MBBS
8.	Dr Bushra Javed	Demonstrator	MBBS

Curricular Map

Module	Duration of Module	Teaching Methodology	Assessment Methodology
Foundation Module & Block 1	<u>Classes :</u> 14 weeks <u>Assessment :</u> 1 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test:</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> 09 weeks <u>Assessment :</u> 1 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test:</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> 09 weeks <u>Assessment :</u> 3 week	• Lectures • CBL • PBL • SDL • Practical	<u>Class Test:</u> Two / three in each module <u>Class Assignment:</u> 5- 10 depending upon each module <u>Modular Examination</u> Theory, Practical, OSPE, VIVA

Academic Calendar Year I

Blocks I (02+12+01= 15 weeks)

- **Module-I**

Introduction to Medicine 02 Weeks

- **Module-II**

Cell Structure & Functions 07 Weeks

- **Module-III**

MSK – I 05 weeks

- EOB 01 week

Block II (09+01= 10 weeks)

- **Module -IV**

Cardiovascular System - I 09 weeks

- EOB 01 week

Block III (4+5+1= 10 weeks)

- **Module-V**

Respiratory system - I 04 Weeks

- **Module - VI**

MSK – II 05 Weeks

EOB 01 Week

BIOCHEMISTRY

BLOCK-I

Introduction		Comprehend the basic concepts of biochemistry	Contents	Lecture	Formative
Module	Topic / theme	Learning outcomes	Learning Objectives	Instructional strategies	Assessment tool
Module-I (02 WEEKS)	Introduction to Medicine	- Recognize the history and importance of medicine as a profession. - Recognize the role of different disciplines in studying the human body - Acknowledge the interdisciplinary nature of medical education and practice	- Recognize the importance of Medicine in human life - Understand the evolution of modern medicine	- Lecture - SGD	Essay/ Assignments
			- Comprehend different medical disciplines, departments and faculty - Comprehend the basic concepts of Physiology, Anatomy, Biochemistry and clinical subjects		
			- Relate the personal experiences and their impact on personal and professional identity formation - Analyze the importance of ethics and professionalism in medicine		
			- Apply the ethical boundaries of conduct as a student. - Comprehend the importance of professionalism for medical doctor		
			Cultivate an understanding of sustainability and environmental consciousness in the context of healthcare		
			Recognize and promote eco friendly practices in medical settings, such as reducing waste, conserving resources, and minimizing the carbon footprint.		

Module-II (07 weeks)	Cell Structure and Function	Apprehend the basic concepts of Biochemistry & biomolecules	• Introduction to biochemistry • Identify the basic elements of biochemistry subject & the Human Genome Project	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structued viva
			• List various Biomolecules • Identify methods for separating biomolecules • Identify methods for determining biomolecular structures		
		Differentiate between biochemical bases of various cytological techniques Recognize the biochemical basis of cytological techniques	• Recognize various cytological techniques - Centrifugation - Ultracentrifugation - Differential Centrifugation Compare biochemical bases of various cytological techniques	• Lectures , • SGD • CBL	• MCQ • SEQ/SAQ • Structued viva
		Appraise role of cell biomarkers	• List various cell biomarkers • Apply biochemical functions of biomarkers in clinical context	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structued viva
		Differentiate between the biochemical aspects of various cell membranes	• Describe biochemical composition of a cell membrane • Discuss fluid mosaic model. • Compare the biochemical significance of different types of membranes - RBCs - Mitochondria, - Nucleus, - ER, - Golgi apparatus etc	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structued viva
		Correlate the	• Explain biochemical composition, functions and	• Lectures ,	• MCQ

		biochemical aspects of cell organelles with their associated disorders- I	associated disorders of various cell organelles - Nucleus (Replication & Transcription) - Ribosomes (Translation) - Peroxisomes (FA metabolism, antioxidant functions, signaling)	• SGD • CBL	• Seq/SAQ • Structured viva
		Correlate the biochemical aspects of cell organelles with their associated disorders- II	Discuss biochemical composition, functions and associated marker enzymes and disorders of various cell organelles - Mitochondria (ETC, TCA, β oxidation of FA, Heme biosynthesis, Urea cycle etc) - Nucleus - Ribosomes - peroxisomes - Golgi Apparatus (post translational modification, Metabolism of FA) - Endoplasmic Reticulum (FA synthesis, transport of various secretory vesicles) - Lysosomes (degradation of glycogen and fat) - endosomes	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structured viva
		Discuss the biochemical processes of signal transduction and its role in health and disease- I	• Describe the chemistry of cell surface receptors and related signaling mechanism • Elaborate the role of signal transduction in health and disease - Cholera - Pertussis	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structured viva
		Discuss the biochemical processes of signal	• Describe the chemistry of intra cellular receptors and related signaling mechanism • Elaborate the role of signal transduction in	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ

		transduction and its role in health	health and disease		• Structured viva
		Differentiate between the biochemical bases of various specialized cellular transport mechanisms	• Compare biochemical bases of various membrane transport mechanisms - GLUTs - SGLT - Carnitine shuttle - H/K ATPase pump - Cl ion channels (Cystic fibrosis) - Malate shuttle - Receptor mediated endocytosis - Glyceraldehyde 3 phosphate shuttle - Aquaporins - ATP sensitive LIPASE	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structured viva
	ENZYMES		• Classify enzymes in the context of medical biochemistry • Outline the mechanism of enzyme action	• Lectures , • SGD • CBL	• MCQ • Seq/SAQ • Structured viva
			• Explain the components of enzymes (apoenzyme, holoenzyme, coenzyme, cofactor, and prosthetic group and isoenzymes) and their biochemical significance		
			• Describe the factors that affect enzyme activity • Define the Michaelis-Menten equation and the Lineweaver-Burk plot, along with their applications in enzyme kinetics (without deriving the equations)	•	•

			• Compare and contrast different types of enzyme inhibition, providing examples and discussing their biomedical significance • Explain the concept of regulatory enzymes		
			• Explain the biochemical role of isoenzymes in clinical enzymology and their significance in disease diagnosis and treatment		
			• Provide an overview of the role of minerals as cofactors • Give an overview of the role of vitamins as coenzymes, focusing on B1, B2, B3, B6, biotin, and pantothenic acid		
			• Clinical Relevance • Compare & contrast apoptosis & necrosis • Recognize the cause of Kartagener syndrome • Apply biochemical functions of cellular biomarkers in clinical context • Correlate associated disorders of various cell organelles: - Endoplasmic Reticulum (ER): - o Cystic Fibrosis - o Non-Alcoholic Fatty Liver Disease (NAFLD) • Lysosomes: - o Gaucher Disease - o Tay-Sachs Disease	Integrated Sessions CBL LGIS	• MCQ • Seq/SAQ • Structured viva

			• Peroxisomes: - o Zellweger Syndrome • Plasma Membrane: - o Hereditary Spherocytosis - o Familial Hypercholesterolemia • Cytoskeleton: - o Duchenne Muscular Dystrophy • Cytoplasmic Inclusions: - o Parkinson's Disease • Elaborate the role of signal transduction in health and disease • Elaborate the role of membrane transport mechanisms in health and disease: - o Cholera - o Pertussis - o Cystic Fibrosis		
	RBC - Pallor/ Jaundice		Heme & Porphyrin metabolism • Elaborate Heme Biosynthesis	• Integrated sessions • CBL • LGIS	• MCQ • Seq/SAQ • Structured viva
			• Explain degradation of Heme, formation of bile pigments, their types, transport and excretion		
			Discuss Porphyrins • Give a brief account of chemistry of Porphyrins		
			• Discuss Hyperbilirubinemia and jaundice		

			- Overview of Role of Iron, Vit B9 & B12 in Nutritional - Explain various Hemoglobinopathies (Hb-S, Hb-C, Hb-SC, Methemoglobinopathies and thalassemia) and elaborate their biochemical causes		
	Inflammation & Immunity – Leucocytosis/ Leucopenia		Plasma Proteins: - Describe the structure, classification and biochemical functions of Plasma proteins Clinical Relevance Describe the clinical disorders associated with Plasma proteins Edema malnutrition Immunoglobulins : Describe the structure, classification and biochemical functions of Immunoglobulins Clinical Relevance - Interpret the significance of altered level of leucocytes Describe the clinical disorders associated with Immunoglobulins: - Malnutrition - Multiple Myeloma	Lectures SGD Integrated sessions/CBL /LGIS	MCQ Seq/ SAQ Structured viva

Suggested Linkers

- | | |
|---|---|
| • Cellular Basis of Health and Disease | Chromosomal disorders/ Hyperbilirubinemia / Nutritional Anemia |
| • RBC | Pallor/ Jaundice |
| • Inflammation & Immunity | Leucocytosis/ Leucopenia |
| • Blood grouping and Transfusion | Transfusion Reaction Hemostasis & Coagulation Bleeding/ Coagulation Disorders |

Practicals	Demonstrate the appropriate use of biochemistry lab equipment	- Introduction to Laboratory Glassware Introduction to Laboratory Equipment: - Spectronic 20/micro lab, - Incubator, - Water bath, - Hot air oven, - Electronic balance - Centrifuge: Perform separation of cell/biomolecules/ cell biomarkers by using centrifugation at different RPM with time - Collection & preservation of clinical specimens - Estimation & clinical interpretation of Serum Bilirubin	- Practical Performance - OSPE	
MODULE-III MUSCULOSKELETAL SYSTEM- I (MSK - I) 05 weeks	Correlate carbohydrate metabolism with energy production required for upper limb movements and physiological mechanisms of muscle contraction in health and disease	Carbohydrate Chemistry: - Classify carbohydrates and explain their biochemical functions - Describe the structure and functions of monosaccharides and list their various derivatives - Explain the structure and functions of disaccharides and oligosaccharides - Discuss the structure, functions, and biochemical roles of polysaccharides - Provide an overview of the digestion and absorption of carbohydrates	Lectures/SGD	MCQs, SAQs, SEQs, OSPE Structured Viva

	• Appraise the significance of various carbohydrates, with a detailed exploration of their biochemical pathways, and elucidate the processes of digestion, absorption, and metabolic utilization in the human body	Carbohydrate Metabolism: <i>Describe the fundamental processes of carbohydrate metabolism and explain their importance in energy production and regulation in the body</i> GLCOLYSIS • Outline the phase reactions of glycolysis and explain the regulation of key enzymes involved in this pathway • Compare and contrast aerobic and anaerobic glycolysis, highlighting their bioenergetics and biochemical significance HMP SHUNT • Describe the HMP shunt (pentose phosphate pathway), its role in producing NADPH and ribose sugars, and explain its importance in protecting cells from oxidative damage • Explain the fate of pyruvate and lactic acid in the context of metabolic pathways, including their role in energy production and the Cori cycle Citric acid cycle • Outline the reactions of the citric acid cycle and describe its role in cellular respiration and ATP production • Discuss the energetics, regulation, and significance of the citric acid cycle, focusing on its anaplerotic and amphibolic nature Gluconeogenesis • Explain the process of gluconeogenesis, including key bypass reactions and the regulation of this pathway in response to hormonal signals Metabolism of fructose, galactose, and lactose • Describe the metabolism of fructose, galactose, and lactose, emphasizing their conversion into intermediates of glycolysis and gluconeogenesis Glycogen metabolism • Explain glycogen metabolism, including the processes of glycogenesis and glycogenolysis, and describe the regulation of these pathways		
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		• Write the reactions involved in glycogenesis and glycogenolysis and explain the biochemical importance of UDP-glucose in these processes • Compare and contrast glycogenesis and glycogenolysis, focusing on their regulation and their roles in maintaining blood glucose levels		
		GAGS • Describe the structure and metabolism of glycosaminoglycans, proteoglycans, and glycoproteins, emphasizing their biological functions and importance in cellular communication and structure		

		Clinical Relevance: Explain pathophysiological basis of Duchenne muscular dystrophy (DMD) • Explain the mechanism of recovery of muscle contraction in poliomyelitis • Comprehend the clinical significance of Monosaccharides, disaccharides and Polysaccharides: Sorbitol, Mannitol, Inulin, Dextran, Hyaluronic acid & Heparin • Discuss the clinical significance of glycolysis, including conditions such as pyruvate kinase deficiency, arsenic poisoning, and lactic Acidosis • Discuss biochemical basis of Hemolytic anemia (G6PD deficiency) • Explain the clinical relevance of the citric acid cycle (TCA) and its involvement in metabolic disorders • Describe the clinical significance of gluconeogenesis, focusing on disorders related to this pathway • Correlate the metabolism of fructose, galactose and lactose with relevant metabolic disorders and enzyme deficiencies • Discuss disorders of glycogen metabolism, specifically glycogen storage disease and their clinical manifestations		
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Bioenergetics & Biological Oxidation	Justify the role of ATP and energy metabolism in health and disease	• Discuss Free energy, Free energy change, endergonic and exergonic reactions and ATP • Describe electron transport chain and its components, organization, reactions, energetics • Describe inhibitors of ETC and inhibitors/Uncouplers of oxidative phosphorylation • Chemiosmotic hypothesis • Oxidative Phosphorylation & its Inherited defects • Mitochondria & apoptosis	Lectures SGD CBL	MCQs, SAQs, SEQs, OSPE Structured Viva
Practicals	Interpret the results	• Carbohydrates Qualitative Analysis-I: - o Molisch test • Carbohydrates Qualitative Analysis-II: - o Benedict test • Carbohydrates Qualitative Analysis-III: - o Iodine test - o Seliwanoff test	• Practical • OSPE	

BLOCK-II

MODULE-IV-CVS

Lipid Chemistry	Analyze the biochemical functions of Fatty acids along with their nutritional role with relevant clinical disorders.	- Define lipids and enumerate their biomedical functions - Describe lipid classification with examples & biochemical significance also explain nutritional significance of lipids - Explain the structure, chemistry, classification and biochemical functions of Fatty acids along with their nutritional role - Describe the chemistry, functions & biochemical significance of Glycolipids, Phospholipids, Waxes and Steroids e.g Cholesterol along with their functions - Explain rancidity of fats, lipid peroxidation and its biochemical significance - Analyze the results of Rancidity of Fats	- Lecture - SGD/ LGIS/ - Practical - OSPE	SEQ/ MCQ/ SAQ/ Structured Viva
Digestion and absorption of lipids	Discuss the digestion and absorption of lipids	- Overview of digestion & absorption of Lipids - Describe the nutritional requirement and biomedical importance of lipid and its effects on human health Clinical relevance: - Correlate the digestion and absorption of lipids with clinical disorders - Explain the disorders related to essential fatty acids deficiency	Lecture/ SGD/ CBL	MCQ/ SAQ/ SEQ/ Structured Viva
Lipid Metabolism	Interpret the	Describe the biosynthesis of fatty acids, their regulation and related disorders	Lecture	MCQ

	clinical condition related to heart, based on anatomical, physiological and biochemical features	• Explain the mobilization and Oxidation of fatty acids along with types of oxidation (beta, alpha, omega & branched chain fatty acids), bioenergetics, regulation and related disorders • Elaborate the oxidation of fatty acids with odd number of carbon atoms and oxidation of unsaturated fatty acids • Explain Triglyceride metabolism (Lipogenesis & Lipolysis) • Explain the metabolism of ketone bodies and correlate their utilization and clinical significance in body	• SGD • CBL	SAQ/SEQ Structured Viva
	• Interpret the clinical conditions associated with vascular system based on anatomical, physiological and biochemical basis	• Explain the steps of Cholesterol synthesis, regulation along with functions and fate in the body • Discuss the synthesis, regulation and biochemical functions of Bile Acids and Bile Salts • Elaborate enterohepatic circulation of bile and bile salts • Discuss the metabolism of Lipoproteins (VLDL, LDL, HDL, and Chylomicrons) with their transport, functions and importance in health and disease • Discuss Apo lipoproteins and their role in lipoprotein metabolism • Describe the metabolism of Glycoproteins and its related metabolic disorders • Explain the classification, synthesis, biochemical functions and clinical importance of Eicosanoids Clinical relevance: • Interpret the histomorphological changes in atherosclerosis, arteriosclerosis and Marfan's Syndrome. • Explain Hypercholesterolemia in relation with pathophysiology of Atherosclerosis	Lecture SGD CBL	MCQ SAQ/SEQ Structured Viva

List of practicals

Practical	- Analyze the results of given experiment - Study the various enzymes related to myocardial infarction	<u>Rancidity of Fats</u> - Estimation & clinical interpretation of serum cholesterol - Lipid profile - LDH - CK - Trop T	Practical	OSPE
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BLOCK III

MODULE V Respiratory system (04 weeks)	Correlate the Anatomy, physiology with its functions and biochemical basis in normal and disease state	Give the overview of chemistry of phospholipids. Elaborate the metabolism of phospholipids	Lecture SGD/CBL	MCQs SEQ/SAQ Structured viva
	Vitamins (Xerophthalmia, Scurvy, Peripheral Neuropathy) Relate the knowledge of water-soluble and fat-soluble vitamins for understanding respective deficiency and excess manifestations	Classify types of vitamins	Lecture SGD/CBL	MCQs SEQ/SAQ Structured viva
		Discuss chemistry, sources, biochemical functions, metabolism and daily allowance of Water-soluble vitamins (Vitamin B Complex and Vitamin C)		
		Discuss chemistry, sources, biochemical functions, Metabolism and daily allowance of Fat-soluble vitamins (Vitamin A, D, E and K)		
		Clinical relevance - Discuss deficiency manifestations and hypervitaminosis of Water-soluble vitamins - Discuss deficiency manifestations and hypervitaminosis of Fat-soluble vitamins - Correlate the biomedical effects of Vitamin A deficiency with acute respiratory syndrome		

	Compare the different modes of gas transport in blood (oxygen and carbon dioxide) and correlate with the biochemical aspect of gaseous exchange	• Describe the structure of Hemoglobin and Myoglobin • Elaborate the globin gene organization • Discuss various types of Hemoglobin and explain its functions in detail • Correlate the Oxygen binding capacity of hemoglobin and myoglobin with reference to the O2- Hb dissociation curve • List various factors affecting and regulating the oxygen binding capacity of hemoglobin Clinical Relevance: • Explain the clinical disorders related to oxygen-Hb binding capacity (Carbon Monoxide Poisoning, Cyanide poisoning and Methemoglobinemia) • Explain various Hemoglobinopathies (Hb-S, Hb-C, Hb-SC and thalassemia)												
	Analyze the physiological and biochemical mechanisms underlying abnormal breathing patterns, hypoxia, and hypercapnia and appraise the role of hyperbaric oxygen therapy in different respiratory diseases	Respiratory Proteins <i>Relate the knowledge of biochemical basis of respiratory proteins</i> • Correlate the chemistry & biomedical significance of respiratory proteins (Hb, Mb, alpha 1 anti-trypsin, elastin, cytochrome oxidase, IgA)	Lecture SGD/CBL	Mcqs Seqs/Saqs Structured viva										
Practicals		• Estimation & clinical interpretation of Vitamin C • Interpretation of HbA1c • Estimation and clinical interpretation of Plasma Proteins	Practical OSPE											
Linkers of Integrated Session; PROPOSED LINKERS <table><tr><td>• Diaphragm & Pleura:</td><td>Pneumothorax, Pleurisy, Congenital Diaphragmatic Hernia</td></tr><tr><td>• Lungs :</td><td>Bronchogenic Carcinoma</td></tr><tr><td>• Oxygen & Carbon dioxide transport:</td><td>Carbon Monoxide Poisoning</td></tr><tr><td>• Abnormal breathing patterns</td><td>Hypoxia</td></tr><tr><td>• Vitamins :</td><td>Xerophthalmia, Scurvy, Peripheral Neuropathy</td></tr></table>					• Diaphragm & Pleura:	Pneumothorax, Pleurisy, Congenital Diaphragmatic Hernia	• Lungs :	Bronchogenic Carcinoma	• Oxygen & Carbon dioxide transport:	Carbon Monoxide Poisoning	• Abnormal breathing patterns	Hypoxia	• Vitamins :	Xerophthalmia, Scurvy, Peripheral Neuropathy
• Diaphragm & Pleura:	Pneumothorax, Pleurisy, Congenital Diaphragmatic Hernia													
• Lungs :	Bronchogenic Carcinoma													
• Oxygen & Carbon dioxide transport:	Carbon Monoxide Poisoning													
• Abnormal breathing patterns	Hypoxia													
• Vitamins :	Xerophthalmia, Scurvy, Peripheral Neuropathy													

MODULE VI MUSCULOSKELETAL SYSTEM – II (05 weeks)	Bone & Muscle Energy Metabolic System (Muscle fatigue & Osteoarthritis)	• Classify amino acids and explain their biochemical functions • Discuss amino acid isomers	• Lectures • SGD / CBL • Integrated sessions	MCQS SEQs/SAQs Structured vivas
		• Explain the buffering action of amino acids • Discuss protein structure and levels of protein organization		
		• Elaborate Protein folding mechanism		
		• Explain the separation techniques for proteins (gel electrophoresis, centrifugation, chromatography, salting out)		
		• Discuss in detail the biochemical structure and functions of collagen and elastin		
		• Elaborate the metabolism of branched chain amino acids		
		• Explain the metabolism of creatine		
	Adjustment of Biomechanics in Human Body in unusual	Clinical relevance • Elucidate the diseases associated with the metabolism of branch chain amino acids • Give an explanation to the disorders related to protein misfolding • Elucidate the diseases associated with the metabolism of branch chain amino acids (BCKD deficiency, Jamaican vomiting sickness) • Give an explanation to the disorders related to protein misfolding (Amyloidosis, Prion diseases)	• Lectures • SGD	MCQ/SA Q/SEQ
		• Classify minerals • Explain the sources, biochemical role and RDA of Macro minerals (Na, K, Ca, Cl, P, Mg, F, S) in human body		

	environment (Acute mountain sickness, Electrolyte Imbalance) Correlate the biochemical basis of mineral metabolism with electrolyte imbalance	• Elucidate the sources, biochemical role and RDA of Micro minerals (Fe, Zn, Cu, Cr, Mn) in human body • Discuss the sources and biochemical role of ultra-trace minerals (I, Se, Mo, Co)		
		Clinical Relevance • Explain the clinical disorders related to disturbances in the levels of minerals in the human body		
Practicals		Interpretation of Serum Electrolytes by Electrolyte Analyzer → Estimation and clinical interpretation of serum Amylase	• Practical • OSPE	

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

To: Trg Branch-CMC

Lt Col
HoD Biochemistry
(Prof Dr Muhammad Javad Yousaf)