STUDY GUIDE BIOCHEMISTRY 1ST Year

MBBS COURSE

Contents

Mission Statement

Guiding your passion to profession

IMC Strives to improve health care in Faisalabad, our country and the world through excellence.

We seek to foster the development of dedicated clinicians, scientists, professionals and educators to provide leadership in education, services and discovery.

Vision:

To be an institution with

- An environment to develop creative free thinking and life long learners.
- A culture of objective research to transform health care delivery.
- Quality professional educational program based on innovation and collaboration.
- High moral and ethical values.
- Serving the needs of community in the best tradition of profession.

Goals:

- To develop humanist, skilled, intellectually disciplined and innovative medical professionals with dedication to those who they treat, lead and serve
- To educate and guide the next generation of leaders in healthcare and medical science to provide and sustain achievements in service, teaching and research.
- To provide comprehensive and effective patient centered, culturally sensitive, compassionate and innovative health care of highest quality to all.
- To recruit, develop and nurture and independent and academically outstanding community of faculty, student, trainees and staff, who each contribute to excellence in our missions.
- To promote professional and personal growth, productive, accountability, integrity and synergistic collaboration and synergy of faculty, students and staff

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INTRODUCTION

WHAT IS A STUDY GUIDE?

It is an aid to:
A. Inform students how student learning program of the subject has been Organized
B. Help students organize and manage their studies throughout the year
C. 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 program.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills,
- Demonstration, tutorial and case based learning that will be implemented to achieve the Learning objectives.
- Provides a list of learning resources such as books, computer assisted learning program, web- links, and journals, for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous and term test on the Student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's
- Achievement of objectives.
- Focuses on information pertaining to examination policy, rules and regulations.

BIOCHEMISTRY FOR 1ST YEAR MBBS

Subject: Biochemistry
Year: 1st year
Duration: 36 weeks

Year	Theory	Practical	Total
1st year	75 hours (50 Lecture, 25 SGD / PBL)	75 hours	150

AT THE END OF 1st YEAR MBBS STUDENT WILL BE ABLE TO
- To describe molecular and functional organization of a cell, and sub-cellular components.
- To describe the chemistry of biomolecules of biologic significance (carbohydrates, lipids, amino acids, polypeptides, nucleic acids).
- To explain mechanisms involved in maintenance of body fluid & pH.
- To discuss the concepts of human nutrition and be familiar with the biochemical role of micro- and macro-nutrients like vitamins, minerals , and electrolytes.
- To explain fundamental aspects of enzymology & clinical applications.
- To performe biochemical techniques to understand the clinical problems in biochemistry.
- To describe the basic biochemical processes in the body.
- To describe large molecules (DNA, RNA, and proteins), and how energy is generated.
- Developing skills as a self-directed learner.

RULES AND REGULATION
- 75% attendance in theory and clinical classes in mandatory.
- All progress will be recorded on clinical log book.
- Pass marks for assessment will be 50%.
- All this will be creadited in internal assessment for Final Professional.
- Any Conflict will be resolved by Co-Ordinator.
- All students will have to fill online feedback perfroma.

LEARNING RESOURCES

The department of Anatomy will require following resources for implementation resources:

- Human resource
- Instructors (faculty members)
- Curriculum coordinator curriculum secretary
- Infrastructure
- Lecture hall with AV aids
- Tutorial room with AV aids
- Biochemistry Lab
- Simulated patients and simulated manikins
- Computers

LISTS OF CONTENT RESOURCES

- Harper's Illustrated Biochemistry by Murrary RK, Granner OK and Rodwell VW, latest edition, McGraw Hill
- Lippincott's Illustrated Reviews: Biochemistry by Harvey R and Ferrier D, Latest edition, published by Lippincott Williams & Wilkins
- Marks' Basic Medical Biochemistry - A Clinical Approach, by Smith C, Marks AD, and Lieberman M. Latest edition, published by Lippincott Williams & Wilkins
- Practicals and Viva in Medical Biochemistry by Dandekar SP and Rane SA, latest edition, published by Elsevier.
- Textbook of Biochemistry with Clinical Correlations by Devlin TM , latest edition, published by Wiley-Liss
- Biochemistry by Berg JM, Tymoczko JL, and Stryer L, latest edition, published by W .H. Freeman and Company
- Clinical Chemistry and Metabolic Medicine by Martin A. Crook, latest edition , Edward Arnold (Publishers) Ltd
- Lehninger Principles of Biochemistry by David L Nelson and Michael M. Cox
- Tietz Textbook of Clinical Chemistry by Burtis CA and Ashwood ER published by Saunders.
- Fundamentals of Biochemistry Life at Molecular Level by Donald Voet, Judith G Voet and Charlotte W . Pratt

E-LEARNING

- e-IMC phone app for online lectures
- IMC youtube channel

JOURNALS

- The Professional Medical Journal
- Independent Review (H-2000)
- Independent Journal of Allied Health Sciences
- Online Journals and Reading Materials through HEC Digital Library Facility

LEARNING METHODOLOGY

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

- Interactive Lectures
- Hospital / Clinic visits
- Small Group Discussion
- Case- Based Learning
- Skills session
- E-Learning
- Self-Directed Study

INTERACTIVE LECTURES: In large group, the lecturer introduces a topic or common clinical conditions and Explains the underlying phenomena through questions, pictures, videos of patients' interviews, Exercises, etc. Students are actively involved in the learning process.

SMALL GROUP DISCUSSION (SGD): This format helps students to clarify concepts acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient case, interviews or discussion topics. Students exchange opinions and apply knowledge gained from lectures, tutorials and self-study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

CASE- BASED LEARNING: A small group discussion format where learning is focused around a series of questions based on a clinical scenario. Students discuss and answer the questions applying relevant knowledge gained in clinical and basic health sciences during the module.

SKILLS SESSION: Skills relevant to respective module are observed and practiced where applicable in skills laboratory or Department of Physiotherapy.

SELF DIRECTED STUDY: Students assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Center, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

E-LEARNING: E-Learning is a strategy by which learning occurs through the utilization of electronic media, typically the Internet. The basic aspects of medical professionalism and ethics will be addressed through an e-learning course

VIDEO SESSIONS: Anatomy is a subject which involves visual learning and formulating concepts. Video assisted learning sessions also provides opportunities to learn gross anatomy.

LABORATORY SESSIONS: Laboratory sessions are important as they provide opportunity for experiential learning in terms of study of slides and identification of tissues

EARLY CLINICAL EXPOSURE (ECE): Clinical skills session are important part of curriculum to achieve psychomotor and affective outcomes. This provide opportunity for medical students in early years and will stimulate contextual learning.

ASSESSMENT

MCQ's and SEQ's

Multiple choice question and short essay question test will be used at the end of part of curriculum to assess the learning of knowledge. These all assessment exercises will be formative. The written tests like Multiple-Choice Questions (MCQs) and Short-Essay Questions (SEQs) test formats are used for the assessment of cognitive domain. The MCQs are more objective and essentially select type of item response format. MCQs have a cueing effect, which promotes guessing and leads to higher scores. In addition, writing MCQs of higher cognitive level of problem solving is challenging. On the contrary, the SEQs are more subjective and have a supply or construct type item response format, which does not have any cueing effect and can effectively assess problem solving skills(8).

OSCE

OSCE will be used to evaluate skills and procedural skills. The OSCE is a method of clinical skill assessment, and it has been reported to be appropriate for assessing learning achievement levels in the psychomotor and emotional domains, which are difficult to evaluate with written examinations(9).

VIVA VOCE

Viva voce is used for assessment of knowledge and problem solving ability of students. This method is useful evaluating cognitive domain.

Practical

Practical test are used for assessment of knowledge and psychomotor skills.

ASSIGNMENTS

Students of different year will be given assignment of different nature such as research and literature search and surveys

Evaluation plan		
Term Test	Written test (MCQ and SEQ)	Formative
After each region / Module	Term Test (OSCE and viva voce)	Formative

INTERNAL ASSESSMENT

i. The weightage of internal assessment shall be 10% of totals marks.
ii. Continuous internal assessment shall consist of evaluation at the end of each assignments, e.g. stages/ sub-stage, class tests etc., attitudinal assessment from educational supervisors.
iii. Assessment of knowledge, Skills and Attitude shall contribute toward internal assessment. Methods used to assess these domains shall include Multiple Choice Questions of one-best type, Short essay questions, Oral/Viva, and Practical/Clinical axaminations.
iv. The score of internal assessment shall contribute to the score in the final examination, Final university examination of each subject shall contribute 90 to total score, and the candidate shall pass in aggregate.
v. Proper record of continuous internal assessment shall be maintained.

BIOCHEMISTRY 1ST YEAR MBBS
EDUCATION PLAN

	Module	Topic	Assessment	Week
1st Term (11 weeks)		Introduction & significance of biochemistry, composition of cell membtance		1
		Membrance phenomenon, transport, membrance receptors		2
		Regulatory, catalytic proteins, single transduction, body buffers	Test 1 MCQs / SEQs	3
		MOA of buffers, biochemical techniques		4
		Definition, function, classification of carbohydrates, monosaccharides	Test 2 MCQs / SEQs	5
		Isomerism, disaccharides, oligosaccharides & importance		6
		Polysaccharides, structure & function, GAGS		7
		Classification & function of lipid & fatty acids	Test 3 MCQs / SEQs	8
		Eicosanoids, physical chemical properties of F.A		9
		Cholestrol, bile, lipid peroxidation & significance	Test 4 MCQs / SEQs	10
	1st Term Test			11
2nd Term (11 weeks)		Biomedical importance of proteins, structure & function of amino acids		12
		Classification of AA. Buffers action of AA organization of proteins		13
		Proteins misfolding, techniques of separation of proteins	Test 5 MCQs / SEQs	14
		Plasma proteins & their functions, albumin		15
		Globulins & immunoglobulins	Test 6 MCQs / SEQs	16
		Classification of enzymes, properties of enzymes		17
		Co-enzymes, cofactor, regulation of enzyme action	Test 7 MCQs / SEQs	18
		MOA & kinetics of enzymes, regulation by gene induction		19
		Biosynthesis of herm & prophyrins, HB & myoglobin		20
		Bilirubins, hemoglobinopathies, nucleotide chemistry	Test 8 MCQs / SEQs	21
	2nd Term Test			22
3rd Term (9 weeks)		Structure of DNA & RNA, purine & Pyrimidines		23
		Fat soluble vitamins, vitamin A & Vitamin D		24
		Fat Soluble vitamin, Vitamin E & Vitamin K	Test 9 MCQs / SEQs	25
		Water soluble vitamin		26
		Water soluble vitamin		27
		Minerals, marco-minerals	Test 10 MCQs / SEQs	28
		Micro-minerals	Test 11 MCQs / SEQs	29
		Nutrition	Test 12 MCQs / SEQs	30
	3rd Term Test			31
(4 Weeks)	Preparation Leaves			32
				33
				34
				35
	Sendup Examination			36

DEPARTMENT OF MEDICAL EDUCATION

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Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
Module 1: Cell Biochemistry	To introduce of biochemistry and its significance in medicine.	••	••	••		••	••	••	••
	To explain Biochemical composition and functions of cell.	••	••	••		••	••	••	••
	To describe transport of substances across the cell membrane.	••	••	••		••	••	••	••
	To describe membrane receptors and membrane-bound proteins G-proteins, adenlylyl cyclase, phospholipase.	••	••	••		••	••	••	••
	To explain Basic methods to study cell biochemistry: Centrifugation , ultracentrifugation , radioimmunoassay, ELISA (enzyme-linked imnunosorbent assay) ; chromatography; electrophoresis , spectrophotometry , and pH metry.	••		••	••	••	••	••	••
Module 2: Water, Buffers and pH	To discuss ionization of water; weak acids and bases	••	••	••		••	••	••	••
	To explain pH and pH scale.	••	••	••		••	••	••	••
	To explain determination of pH of buffer and Henderson-Hasselbalch equation and its applicat ions.	••	••	••		••	••	••	••
	Tp explain body buffer systems (bicarbonate , ammonia , phosphate, and proteins) and their mechanism of action.	••	••	••		••	••	••	••
Module 3: Carbohydrates	To define biochemical functions and classification of carbohydrates.	••	••	••		••	••	••	••
	To explain structure and function of biologically important monosaccharides and their important derivatives.	••	••	••		••	••	••	••
	To discuss Isomerism in carbohydrates (types and description)	••	••	••		••	••	••	••
	To explain biologically important disaccharides, their properties and their biomedical importance	••	••	••		••	••	••	••
	To describe oligosaccharides, their combination with other macromolecules and their biomedical importance.	••	••	••		••	••	••	••
	To explain homopolysaccharides of biologic significance and their structural and functional characteristics	••	••	••		••	••	••	••
	To discuss structural and functional characteristics of heteropo lysaccharides including details of glycosaminoglycans; proteoglycans, peptidoglycans; and mucopolysaccharidoses.	••	••	••		••	••	••	••

Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
Module 4: Proteins and AminoAcids	To describe biomedical importance and classification of proteins.	••	••	••		••	••	••	••
	To explain structure, functions and properties of amino acids.	••	••	••		••	••	••	••
	To classify standard (proteinogenic) amino acids, biologically important non-standard (non-proteinogenic) amino acids and their principal functions.	••	••	••		••	••	••	••
	To explain importance of amino acids in the maintenance of pH; and mechanism of buffering action of proteins .	••	••	••		••	••	••	••
	To describe structural organization of proteins.	••	••	••		••	••	••	••
	To explain important techniques for separation of proteins (electrophoresis , isoelectric focusing, chromatography, filtration, centrifugation, and dialysis).	••	••	••	••	••	••	••	••
	To describe immunoglobulins; their types; structure, and biomedical significance.	••	••	••		••	••	••	••
	To describe plasma proteins and their principal biologic functions along with their clinical significance.	••	••	••		••	••	••	••
	To explain glycoproteins.	••	••	••		••	••	••	••
Module 5 Nucleotides	To describe chemistry of purines and pyrimidines.	••	••	••		••	••	••	••
	To explain structure and functions of nucleotides and nucleosides.	••	••	••		••	••	••	••
	To discuss derivatives of purines and pyrimidines and their role.	••	••	••		••	••	••	••
	To describe structure, functions and types of nucleic acids.	••	••	••		••	••	••	••
Module 6: Lipids and Fatty Acids	To describe classification of lipids and their biological functions.	••	••	••		••	••	••	••
	To describe fatty acids and the importance of their dietary use.	••	••	••		••	••	••	••
	To discuss nutritionally essential fatty acids and their functions	••	••	••		••	••	••	••
	To explain eicosanoids and their biologic functions along with their significance in health and disease	••	••	••		••	••	••	••
	To describe physical and chemical properties of fats and oils.	••	••	••		••	••	••	••
	To describe structure and biologic functions & significance of phospholipids, glycolipids , sulfolipids and gangliosides.	••	••	••		••	••	••	••
	To explain cholesterol and its related compounds such as bile acids: Structure, properties and biologic role.	••	••	••		••	••	••	••
	To explain Lipid peroxidation and its significance	••	••	••		••	••	••	••
Module 7: Enzymes	To describe classification and nomenclature of enzymes.	••	••	••		••	••	••	••
	To describe properties of enzymes.	••	••	••		••	••	••	••
	To explain coenzymes and cofactors.	••	••	••		••	••	••	••
	To discuss Isozymes and Allosteric enzymes their clinical significance.	••	••	••		••	••	••	••
	To describe types of enzyme inhibitors and their biomedical importance.	••	••	••		••	••	••	••
	To explain mechanism of enzyme action and kinetics of enzyme activity.	••	••	••		••	••	••	••
	To explain regulation of enzyme activity.	••	••	••		••	••	••	••
	To enumerate therapeutic use of enzymes and diagnostic application of determination of enzyme activities of certain enzymes in plasma in hepatic, muscle, prostatic, pancreatic,bone and cardiac diseases.	••	••	••		••	••	••	••

Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
Module 8: Porphyrins and proteins	To describe chemistry and biosynthesis of heme and other porphyrins.	••	••	••		••	••	••	••
	To explain important hemoproteins found in body along with their principal biologic functions.	••	••	••		••	••	••	••
	To describe oxygen binding capacity of hemoglobin, factors affecting and regulating the oxygen-binding capacity of hemoglobin. Methaemoglobin (metHb) and methaemoglobinemia.	••	••	••		••	••	••	••
	To describe bilirubin Metabolism: Degradation of heme, synthesis, hepatic uptake, conjugation, and excretion of bilirubin and fate of bilirubin in intestine.	••	••	••		••	••	••	••
	To explain hyperbilirubinemias and Hemoglobinopathies.	••	••	••		••	••	••	••
Module 9: Vitamins and minerals	To descirbe general features of vitamins as essential nutrients.	••	••	••		••	••	••	••
	To classify vitamins according to their and biochemical functions.	••	••	••		••	••	••	••
	To explain important dietary sources and recommended dietary allowances of vitamins .	••	••	••		••	••	••	••
	To describe mechanism of action of vitamins and their biochemical functions in body.	••	••	••		••	••	••	••
	To explain disorders associated with vitamin deficiency and hypervitaminoses.	••	••	••		••	••	••	••
	To describe minerals and their sources, absorption, transport, storage, and biochemical functions along with their recommended dietary allowances (RDA).	••	••	••		••	••	••	••
Module 10: Nutrition	To describe energy metabolism: Caloric value of food, Specific dynamic action (SDA) of food , respiratory quotient , metabolic rate (determination and factors affecting metabolic rate), basal metabolic rate (BMR) (measurement , calculation, and factors affecting BMR)	••	••	••		••	••	••	••
	To explain balanced diet.	••	••	••		••	••	••	••
	To describe improtance of proteins in nutrition.	••	••	••		••	••	••	••
	To describe role of fats and lipids in nutrition.	••	••	••		••	••	••	••
	To explain the role of carbohydrates in human nutrition.	••	••	••		••	••	••	••
	To calculate caloric requirement of a person and nutritional requirements in pregnancy, lactation, infancy, and old age.	••	••	••		••	••	••	••
Module 11 Extracellular matrix	To describe types and structure of collagen ; biosynthesis & degradation of collagen.	••	••	••		••	••	••	••
	To describe elastin: Structural characteristics of elastins.	••	••	••		••	••	••	••
	To describe deGlycosaminoglycans (GAGs): Structure , classification , functions and distribution of GAGs ; diseases associated with enzyme deficienc ies of degradation of GAGs (mucopolysaccharidoses - Hunter syndrome & Hurler syndrome)	••	••	••		••	••	••	••
	To explain structure and functions of proteoglycan.	••	••	••		••	••	••	••

Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
Module 12 Practical biochemistry tests	To introduce use of laboratory facilities and equipment including safety measures		••		••			••	••
	To demonstrate preparation of solutions.		••		••			••	••
	To demonstrate basic methods of laboratory calculations.		••		••			••	••
	To describe and conversion of conventional and SI measuring units.		••		••			••	••
	To demonstrate buffer action, and determination of pH (by using indicators and pH meter).		••		••			••	••
	To perform qualitative analysis of carbohydrates and proteins.		••		••			••	••
	To perform tests to detect monosaccharides of biomedical significance — glucose, fructose and Galactose (Benedict 's test, Selivanoff's test, and Osazone test)		••		••			••	••
	To perform tests to detect proteins I peptides I amino acids (Heat coagulation test, sulphosalicylic acid test, Heller's Ring test and Ninhydrin test)		••		••			••	••
	To demonstrate collection and storage of urine samples for laboratory analysis, and physical and chemical analysis of urine to detect normal and abnormal constituents.		••		••			••	••

TOS 1ST PROFESSIONAL (PART-1) BIOCHEMISTRY

TABLE OF SPECIFICATION (ToS)			
		MCQ'S	SEQ'S
	Biochemistry of the cell, cell membrane, and membrane phenomena water, pH and buffers	0.5	3
	Extracellular matrix	0.5	2
	Chemistry of carbohydrates	1.0	4
	Chemistry of lipids	1.0	5
	Chemistry of proteins and amino acids, plasma proteins including immunoglobulins.	1.0	6
	Chemistry of nucleotides and nucleic acids	0.5	3
	Enzymes	1.0	5
	Vitamins	1.5	7
	Nutrition	0.5	2
	Minerals and trace elements	0.5	4
	Home metabolism, porphyrins, jaundice, hemoglobin & myoglobin, hemoglobinopahties	1.0	4
	Total items	09 SEQs	45 MCQs
	Total marks (5 marks for each SEQs and 1 mark for each MCQs)	45 marks	45 marks

25% of MCQs and SEQs should be clinically oriented or problem-based.
10% marks are allocated for "Internal Assessment"
Total Marks For Theory Paper: SEQs+ MCQs+ Internal Assessment = 45+45+10=100 marks

BIOCHEMISTRY
Total marks: 100

TABLE OF SPECIFICATIONS	
Examination Component	**Marks**
A: Internal Assessment	10
B: Practical notebook / Mnaual (Internal Examiner)	05
C: Viva voce a. External examiner: 25 Marks b. Internal Examiner: 25 Marks	50
D: OSPE a. Observed stations (6 marks): There are two observed stations: 3 marks for each station – time allowed is 3 miutes for each observed station b. Non-observed stations (16 marks): There are eight non-observed station: 2 marks for each station – time allowed is 2 minutes for each non-observed station.	22
E: Practical a. Principal supposed calculation, etc: 4 marks (External Examiner) b. Performance of the experiment: 4 marks (Internal Examiner) c. Structured table viva: 5 marks (External Examiner)	13

WEEKLY TIME TABLE 1ST YEAR MBBS 2022

INDEPENDENT MEDICAL COLLEGE

Time	Lecture 08:00 - 10:00	Lecture 10:00 - 11:45	Break 11:45 - 12:15	Lecture 12:15 - 02:00	SDL 02:00 - 02:30
Mon	Anatomy	Physiology	Break	Biochemistry	SELF DIRECTED LEARNING (SDL)
Tue	Anatomy	Physiology		Biochemistry	
Wed	Anatomy	Physiology		Biochemistry	
Thu	Anatomy	Physiology		Biochemistry	
Fri	08:00 - 08:45	08:45 - 09:30	09:30 - 11:00	11:00 - 12:00	
	Behavioral Science	Islamiyat / Pak Study	Anatomy	Physiology	
Sat	08:00 - 10:00	10:00 - 11:45	11:45 - 12:15	12:15 - 02:00	
	Clinical Anatomy	Clinical Physiology	Break	Clinical Biochemistry	

w.e.f. 17-Jan-2022

Date: _____ File No. 22-Edn/ / IMC

Prof. Abdul Hafeez Chaudhary
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Principal