

# STUDY GUIDE BIOCHEMISTRY 2<sup>nd</sup> Year

## MBBS COURSE

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# 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

**Independent Medical College, Faisalabad.**  
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## INTRODUCTION

### WHAT IS A STUDY GUIDE?

It is an aid to:

- Inform students how student learning program of the subject has been Organized
- Help students organize and manage their studies throughout the year
- 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 2ND YEAR MBBS

**Subject: Biochemistry**

**Year: 2nd year**

**Duration: 36 weeks**

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

### AT THE END OF 2nd 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 perform 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 credited in internal assessment for Final Professional.
- Any Conflict will be resolved by Co-Ordinator.
- All students will have to fill online feedback performa.

## 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 Murray 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 examinations.
- 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 2ND YEAR MBBS EDUCATION PLAN

	Module	Topic	Assessment	Week
1st Term (11 weeks)				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
		1st Term Test		
2nd Term (11 weeks)				12
				13
				14
				15
				16
				17
				18
				19
				20
				21
		2nd Term Test		
3rd Term (9 weeks)				23
				24
				25
				26
				27
				28
				29
				30
		3rd Term Test		
(4 Weeks)	Preparation Leaves			32
				33
				34
		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 13 Bioenergetics and Biological Oxidation	To describe endergonic and exergonic reactions, ATP and other compounds as carriers of energy.	••	••	••		••	••	••	••
	To explain electron transport chain & its components and organization.	••	••	••		••	••	••	••
	To describe reactions of electron transport chain.	••	••	••		••	••	••	••
	To explain steps of oxidative phosphorylation.	••	••	••		••	••	••	••
Module 14 Carbohydrate Metabolism	To describe glycolysis and its significance.	••	••	••		••	••	••	••
	To explain Tricarboxylic acid (TCA) cycle and their regulation.	••	••	••		••	••	••	••
	To describe gluconeogenesis and Biomedical significance.	••	••	••		••	••	••	••
	To discuss steps of glycogen metabolism.	••	••	••		••	••	••	••
	To elaborate regulation of blood glucose level.	••	••	••		••	••	••	••
	To explain biochemical bases of diabetic mellitus.	••	••	••		••	••	••	••
Module 15: Lipid Metabolism	To describe de novo synthesis of fatty acids.	••	••	••		••	••	••	••
	To explain Synthesis and storage of triacylglycerols in body with its regulation.	••	••	••		••	••	••	••
	To explain steps of oxidation of fatty acids.	••	••	••		••	••	••	••
	To describe synthesis and utilization of ketone bodies.	••	••	••		••	••	••	••
	To discuss ketoacidosis and regulation of ketogenesis.	••	••	••		••	••	••	••
	To explain eicosanoids, their regulation and biomedical importance.	••	••	••		••	••	••	••
	To explain metabolism of phospholipids and sphingolipids.	••	••	••		••	••	••	••
	To outline cholesterol metabolism.	••	••	••		••	••	••	••
	To describe bile acids and their significance in health and disease.	••	••	••		••	••	••	••
	To describe plasma lipoproteins.	••	••	••		••	••	••	••
To explain Biochemical defects leading to fatty liver.	••	••	••		••	••	••	••	
Module 16: Metabolism of proteins and amino acids	To give an overview of protein turnover in human body; nitrogen balance (positive and negative).	••	••	••		••	••	••	••
	To explain metabolism of amino acids.	••	••	••		••	••	••	••
	To give an overview of amphibolic intermediates formed from the carbon skeleton of amino acids.	••	••	••		••	••	••	••
	To explain role of amino acid in nutrition.	••	••	••		••	••	••	••
	To discuss protein deficiencies and requirement.	••	••	••		••	••	••	••
	To explain protein structures in hormones.	••	••	••		••	••	••	••



Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
Module 17: Regulation of Metabolism	To explain Fed-fast cycle and starvation.	••	••	••		••	••	••	••
	To describe Basic concepts of intermediary metabolism, introduction of anabolic and catabolic pathways.	••	••	••		••	••	••	••
	To give an overview of regulation and integration of various metabolic pathways.	••	••	••		••	••	••	••
Module 18: Metabolism of Nucleotides	To describe de novo Synthesis of purines and pyrimidines.	••	••	••		••	••	••	••
	To discuss disorders associated with purine nucleotide metabolism like adenosine deaminase deficiency, purine nucleoside phosphorylase deficiency, and hyperuricemia	••	••	••		••	••	••	••
	To explain natural and synthetic derivatives of purines and pyrimidines and their role in health and disease.	••	••	••		••	••	••	••
Module 19: Biochemical Genetics	To describe the structural basis of cellular information	••	••	••		••	••	••	••
	To explain Organization of DNA: chromosomes, Karyotyping.	••	••	••		••	••	••	••
	To describe basic molecular biology techniques, DNA extraction; recombinant DNA technology; DNA cloning; polymerase chain reaction (PCR); hybridization; blotting techniques .		••					••	••
	To explain oncogenes and their role in carcinogenesis.	••	••	••		••	••	••	••
	To give an over view of genetic basis of disease.	••	••	••		••	••	••	••
	To describe Important tumor markers and their clinical significance (Carcinoembryonic Antigen, Alpha fetoprotein, human chorionic gonadotropin, calcitonin and prostatic acid phosphatase).	••	••	••		••	••	••	••

Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
<b>Module 20: Biochemistry of endocrine system</b>	To give an over view an overview of endocrine system; classification of hormones based on their mechanism of action.	••	••	••		••	••	••	••
	To describe pituitary and hypothalamic hormones and their clinical significants, Disorders associated these hormones such as growth hormone deficiency (dwarfism), gigantism, acromegaly, Cushing's syndrome, Addison's disease, Diabetes insipidus, and the inappropriate secretion of ADH (SIADH).	••	••	••		••	••	••	••
	To describe Thyroid Hormones disorders associated with hyper- and hypo-activities of these hormones like goiter, hypothyroidism , hyperthyroidism , Graves' disease .	••	••	••		••	••	••	••
	To explain calcium Regulating Hormones, Role of parathyroid hormone, calcitriol, and calcitonin in calcium homeostasis; hypoparathyroidism, hyperparathyro idism (primary, secondary, and tertiary), pseudohypoparathyroidism, rickets, and osteomalacia).	••	••	••		••	••	••	••
	To explain adrenal Cortical Hormones, Disorders associated with hyper- and hypo-activities of these hormones like Cushing's disease I syndrome , secondary adrenal deficiency, Addison's disease , primary aldosteronism and secondary aldosteron ism .	••	••	••		••	••	••	••
	To describe adrenal Medullary Hormones and associated disorders like pheochromocytoma.	••	••	••		••	••	••	••
	To discuss Male and Female Gonadal Hormones, hypergonadism and hypogonadism in males and females.	••	••	••		••	••	••	••
	To outline hormones of Pancreas, Disorders associated with hyper- and hypo-activities of these hormones like; pathophysiology of insulin deficiency and diabetes mellitus	••	••	••		••	••	••	••
<b>Module 21: Biochemistry of Gastrointestinal system</b>	To give introduction and regulation of various digestive juices of GIT such as saliva, gastric juice & HCl, pancreatic juice, bile, and succus entericus	••	••	••		••	••	••	
	To describe hydrolysis (digestion) of carbohydrates, lipids, proteins, and nucleic acids in gastrointestinal tract.	••	••	••		••	••	••	
	To explain absorption of carbohydrates, lipids and amino acids.	••	••	••		••	••	••	
	To discuss disease states associated with GIT disorders like achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis and pernicious anemia, cystic fibrosis and celiac disease.	••	••	••		••	••	••	
	To explain site of synthesis and major actions of gastrointestinal hormones like gastrin, cholecystokinin (CCK), secretin, gastric inhibitory peptide (GIP), vasoactive intestinal polypeptide (VIP), motilin, enkephalins, substance P, neurotensin, and enteroglucagon.	••	••	••		••	••	••	
<b>Module 22: Metabolism of xenobiotics</b>	To define and classify important xenobiotics of medical relevance.	••	••	••		••	••	••	••
	To explain Phase II metabolism of xenobiotics; types of phase II reactions	••	••	••		••	••	••	••
	To describe responses to xenobiotics including pharmacologic, toxic, immunologic and carcinogenic effects.	••	••	••		••	••	••	••

Modules	Objectives	Instructional strategy				Assessment			
		Lecture	SGD	PBL	Lab	MCQ	SEQ	OSPE	Viva
<b>Module 23: Water &amp; electrolyte balance; acid-base regulation</b>	To discuss water and electrolyte balance in body: Fluid compartments of the body; gain and loss of body water; regulation of body water balance.	••	••	••		••	••	••	••
	To describe body buffer systems, role of lung and kidney in maintenance of acid-base balance.	••	••	••		••	••	••	••
	To explain acid-base disturbance in the body like respiratory and metabolic acidosis (lactic acidosis and ketoacidosis); respiratory and metabolic alkalosis; concept of anion gap, base excess and base deficit.	••	••	••		••	••	••	••
	To interpret laboratory report of arterial blood gases.	••	••	••		••	••	••	••
<b>Module 24 Practical special biochemistry</b>	To describe techniques and instrumentation of clinical biochemistry.		••		••			••	••
	To demonstrate Collection, preservation, and storage of blood sample.		••		••			••	••
	To perform estimation of various substances in blood and other biological fluids, like glucose, creatinine, urea, protein, albumin, uric acid, and calcium, total cholesterol; HDL cholesterol, and triacylglycerols; demonstration of creatinine clearance; and oral glucose tolerance test (OGTT)		••		••			••	••
	To demonstrate plasma enzyme activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST), amylase, creatine phosphokinase (CK), alkaline phosphatase (ALP), and lactate dehydrogenase (LDH)		••		••			••	••
	To explain clinical interpretation of common laboratory values of the compounds and enzymes.		••		••			••	••
	To demonstrate determination of amino acids in urine by paper chromatography.		••		••			••	••

<b>TABLE OF SPECIFICATION (ToS)</b>			
		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, hemoglobinopathies	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**

<b>TABLE OF SPECIFICATIONS</b>	
<b>Examination Component</b>	<b>Marks</b>
A: Internal Assessment	10
B: Practical notebook / Manual (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 minutes for each observed station b. Non-observed stations (16 marks): There are eight non-observed stations: 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 Behavioral Science	08:45 - 09:30 Islamiyat / Pak Study		09:30 - 11:00 Anatomy	
Sat	08:00 - 10:00 Clinical Anatomy	10:00 - 11:45 Clinical Physiology	11:45 - 12:15 Break	12:15 - 02:00 Clinical Biochemistry	

w.e.f. 17-Jan-2022

Date: \_\_\_\_\_ File No. 22-Edu / IMC

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