



# **Department of Biochemistry**

**Students' Study Guide Year:  
1<sup>ST</sup> Year BDS**

## **MISSION OF DEPARTMENT OF BIOCHEMISTRY**

### **Mission**

- To educate scholars molecular and biochemical basis of diseases in integration with other basic and clinical sciences at undergraduate and postgraduate level so that they can display excellence in professional growth, academics, research and delivery of medical care to the community.
- To produce dedicated and updated faculty in the field of biochemistry and molecular sciences.
- To conduct high quality research for publication in impact factor journals.

### **Introduction**

Biochemistry is the study of chemical processes in living organism and governs all living organisms and living processes. By controlling information flow through biochemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the incredible complexity of life.

Today, the main focus of pure biochemistry is in understanding how biological molecules give rise to the processes that occur within living cells, which in turn relates greatly to the study and understanding of whole organisms.

Much of biochemistry deals with the structures, functions and interactions of biological macromolecules, such as proteins, nucleic acids, carbohydrates and lipids, which provide the structure of cells and perform many of the functions associated with life. The mechanisms by which cells harness energy from their environment via chemical reactions are known as metabolism. In medicine, biochemists investigate the causes and cures of disease.

### **Learning Outcomes of Course of Biochemistry**

After completing the course of Biochemistry, the student of 1st Year BDS will be able to:

- Gain knowledge about the composition, properties and significance of biomolecules, cell, cell membrane & enzymes.
- Understand chemistry and metabolism of carbohydrates, proteins, haem and lipids.
- Describe the sources, RDA, biomedical roles and deficiency state of vitamins, minerals and electrolytes.
- Handle various instruments and perform colour tests and estimations in the lab.

## **Teaching and learning methodologies**

Teaching and learning methods are primarily focused more on promoting active learning through active participation of the learner. Actively learning students take charge of their own learning, actively seeking guidance and performance feedback from tutors, and routinely conducting self-assessment of their own learning needs.

## **Teaching and learning modalities**

- Large Group Interactive Sessions (LGIS)
- Small Group Interactive Sessions (SGIS)
- Self-Directed Learning (SDL)

Following teaching modalities may be used for small group teaching:

1. Video demonstrations
2. Students' presentations
3. Discussions
4. Peer Assisted learning/Tutorials
5. Projects/ Assignments

## **Total number of Hours:**

Name	Biochemistry
Duration	111 Hrs
No of LGIS	40.5 Hrs
No of tutorials	18 Hrs
No of Practical	169.5 Hrs

## **Recommended Book**

Lippincott Illustrated Reviews: Biochemistry (Lippincott Illustrated Reviews Series) 8th Edition

## **Reference Book**

Harper's Illustrated Biochemistry, Thirty-first Edition

## **Practical Journal**

Printed practical journal biochemistry, 1<sup>st</sup> Year BDS, FUCD

## FACULTY OF DEPARTMENT OF BIOCHEMISTRY

Co-ordinator

Assistant Professor Dr. Aneela shabbir (MBBS, M.Phil, ACMED)

Demonstrator  
Dr. Khola Raashid

Demonstrator  
(name)

## **COURSE OUTLINE**

<b>S.No.</b>	<b>Course content</b>	<b>LEARNING OBJECTIVE</b>	<b>TEACHING STRATEGY</b>	<b>ASSESSMENT TOOL</b>
1.	<b>Introduction of Biochemistry</b>	By the end of the session, students of 1 <sup>st</sup> year BDS will be able to: <ul style="list-style-type: none"> <li>• Define all the important terms.</li> </ul>	LGIS SDL	MCQs
2.	<b>Biochemistry of the Cell &amp; Biological Membrane</b>	<ul style="list-style-type: none"> <li>• Describe Cell membranes and their chemical composition</li> <li>• Define Importance of lipids and proteins in cell membranes</li> <li>• Explain Cellular organelles along with biochemical markers / enzymes and significance</li> <li>• Describe Transport mechanism across cell membrane</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials Formative assessments
3.	<b>Nucleotide and Nucleic Acid</b>	<ul style="list-style-type: none"> <li>• Describe Chemistry and structure of nucleotides and their biochemical roles</li> <li>• Define Nucleic acids, their types, structure and functions</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials
4.	<b>Enzymes</b>	<ul style="list-style-type: none"> <li>• Classify enzymes into various groups.</li> <li>• Understand Chemistry of the active site</li> <li>• Describe Co-enzymes and co-factors</li> <li>• Discuss Clinical significance of Michaelis – Menten kinetics</li> <li>• Describe enzyme inhibition and enzymes inhibitors</li> <li>• Describe various mechanisms of regulation of enzyme activity</li> <li>• Discuss Iso enzymes and their clinical importance</li> </ul>	LGIS SGIS SDL	MCQs SEQs Quiz Structured Tutorials

		<ul style="list-style-type: none"> <li>Discuss Therapeutic uses and application of enzymes in clinical diagnosis</li> </ul>		
5.	<b>Digestive Enzymes in GIT Secretions</b>	<ul style="list-style-type: none"> <li>Describe the chemical composition, important enzymes and role of:             <ol style="list-style-type: none"> <li>Saliva</li> <li>Gastric secretions</li> <li>Pancreatic secretions</li> <li>Bile</li> <li>Succus Entericus</li> </ol> </li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials
6.	<b>Vitamins</b>	<ul style="list-style-type: none"> <li>Describe Introduction, classification of Vitamins chemistry, active forms, biochemical functions, deficiency manifestations, RDA and sources of water soluble and fat-soluble vitamins</li> <li>Discuss Hypervitaminosis</li> </ul>	LGIS SGIS SDL	MCQs SEQs Quiz Structured Tutorials
7.	<b>Mineral &amp; Trace Elements</b>	<ul style="list-style-type: none"> <li>Classify and discuss Biochemical roles and metabolism of Macro minerals (Na, K, Ca, PO<sub>4</sub>) &amp; Micro minerals (Iron, fluoride, Iodine, Copper, zinc, selenium, molybdenum)</li> </ul>	LGIS SGIS SDL	MCQs SEQs Quiz Structured Tutorials
8.	<b>Porphyrins &amp; Hemoglobin</b>	<ul style="list-style-type: none"> <li>Understand Chemistry and biosynthesis of porphyrins &amp; Heme and related disorders (porphyrias)</li> <li>Describe Structure, functions and types of hemoglobin &amp; Hemoglobinopathies (Hb-S, Thalassemia)</li> <li>Discuss Degradation of heme, Hyperbilirubinemia, their biochemical causes and differentiation, Jaundice and its types</li> </ul>	LGIS SGIS SDL Lab Demonstration	MCQs SEQs Structured Tutorials OSPEs
9	<b>Carbohydrate Chemistry</b>	<ul style="list-style-type: none"> <li>Define various terms</li> <li>Understand Chemistry and classification of CHO</li> <li>Describe Structure, functions and importance of</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured

		<ul style="list-style-type: none"> <li>i. Monosaccharides,</li> <li>ii. Disaccharides</li> <li>iii. Oligosaccharides</li> <li>iv. Polysaccharides</li> </ul>	Lab Demonstration	Tutorials OSPEs
<b>10</b>	<b>Carbohydrate Metabolism</b>	<ul style="list-style-type: none"> <li>• Describe the process of Digestion &amp; Absorption of CHO and following reactions</li> <li>i. Glycolysis</li> <li>ii. Krebs Cycle</li> <li>iii. Gluconeogenesis</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials
<b>11</b>	<b>Proteins Chemistry</b>	<ul style="list-style-type: none"> <li>• Define &amp; Classify proteins based on: <ul style="list-style-type: none"> <li>i. Physiochemical properties</li> <li>ii. Functions</li> <li>iii. Nutritional requirements</li> <li>iv. Structure</li> </ul> </li> <li>• Define Amino acids, their structure, properties and functions</li> <li>• Describe Classification and nutritional significance of amino acids</li> <li>• Describe Structural organization of proteins and its significance</li> <li>• Discuss Immunoglobulins and their biomedical significance</li> <li>• Enlist important Plasma proteins &amp; their clinical significance</li> </ul>	LGIS SGIS SDL  Lab Demonstration	MCQs SEQs Structured Tutorials  OSPEs
<b>12</b>	<b>Protein Metabolism</b>	<ul style="list-style-type: none"> <li>• Describe Digestion &amp; Absorption of Proteins</li> <li>• Discuss Ammonia Formation (Transamination &amp; Deamination)</li> <li>• Describe NH<sub>3</sub> Transportation in the body</li> <li>• Describe Urea Cycle &amp; its regulation</li> <li>• Describe Hyperammonemias (types, causes, biochemical effects &amp; toxicity)</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials
<b>13</b>	<b>Eicosanoids</b>	<ul style="list-style-type: none"> <li>• Describe Types, Biosynthesis and biochemical functions of eicosanoids</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorial

<b>14</b>	<b>Lipids Chemistry</b>	<ul style="list-style-type: none"> <li>• Classify lipids and fatty acids</li> <li>• Describe Chemistry, classification, properties and biochemical function of Fatty Acid and lipids</li> <li>• Enumerate Essential fatty acids</li> <li>• Discuss Chemistry of Phospholipids, Glycolipids, Sphingolipids and their biochemical significance</li> </ul>	LGIS SGIS SDL  Lab Demonstration	MCQs SEQs Structured Tutorials  OSPE
<b>15</b>	<b>Lipid Metabolism</b>	<ul style="list-style-type: none"> <li>• Describe Digestion and absorption of Lipids</li> <li>• Describe the steps of:               <ol style="list-style-type: none"> <li>i. Triacylglycerol Biosynthesis</li> <li>ii. Fatty Acid Synthesis</li> <li>iii. Beta Oxidation of fatty acids &amp; its energy yield                   <ul style="list-style-type: none"> <li>• Discuss Cholesterol metabolism &amp; its regulation</li> <li>• Describe Lipoprotein metabolism (Chylomicrons, LDL, HDL, VLDL)</li> </ul> </li> </ol> </li> </ul>	LGIS SGIS SDL Lab Demonstration	MCQs SEQs Structured Tutorials OSPE
<b>16</b>	<b>Bioenergetics</b>	<ul style="list-style-type: none"> <li>• Describe electron transport chain and oxidative phosphorylation.</li> <li>• Discuss inhibitors and uncouplers of oxidative phosphorylation.</li> </ul>	LGIS SGIS SDL	MCQs SEQs Structured Tutorials

**BDS FIRST PROFESSIONAL EXAMINATION**  
**BIOCHEMISTRY**  
**MARKS DISTRIBUTION**

**THEORY MARKS DISTRIBUTION:**

Total Marks of MCQs = 40 Marks

Total Marks of SEQs = 50 Marks (10 SEQs. Each SEQ of 5 Marks)

Internal Assessment: 10

Total Marks of Theory: 100

**PRACTICAL MARKS DISTRIBUTION:**

Total Marks of OSPE = 40 Marks

Total Marks of Viva = 50 Marks (25 Marks Internal Examiner, 25 Marks External Examiner)

Internal Assessment: 10

Total Marks of Practical: 100

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