

## STUDY GUIDE

<b>PROGRAM</b>	<b>BDS</b>
<b>COURSE TITLE</b>	<b>Biochemistry</b>
<b>ACADEMIC YEAR</b>	<b>1<sup>st</sup> Year, 2023</b>
<b>INTRODUCTION</b>	Biochemistry is one of the essential basic science disciplines which dental students across Pakistan and outside study. This discipline helps students learn about the molecular basis of body functions. There is also an introduction to other body systems in order to provide a more holistic view of the body to the learners.
<b>OUTCOMES</b>	By the end of this course, students will be able to describe the various complex molecular structures, metabolisms & functions at a molecular level.
<b>DEPARTMENTS INVOLVED</b>	Biochemistry
<b>LECTURE OBJECTIVES</b>	<p>By the end of the course, the students will be able to:</p> <p><u>BIOCHEMISTRY OF CELL</u></p> <ul style="list-style-type: none"> <li>• Discuss importance of Biochemistry in Dentistry</li> <li>• Describe the important micro and macro molecules found in the cell and the major functions of Organelles.</li> <li>• Discuss the biochemical structure and functions of cell membrane</li> <li>• Discuss the biochemical structure and properties of water</li> <li>• Describe different types and mechanism of action of Buffers, Acidosis &amp; Alkalosis</li> </ul> <p><u>CARBOHYDRATE CHEMISTRY</u></p> <ul style="list-style-type: none"> <li>• Define carbohydrates</li> <li>• Classify carbohydrates</li> <li>• Describe various sources &amp; biomedical importance of carbohydrates.</li> <li>• Define Monosaccharides, Disaccharides and Oligosaccharides</li> <li>• Classify Mono- , Di- and Oligo- saccharides</li> </ul>

- Describe various sources and biomedical importance of Mono- , Di- and Oligo- saccharides
- Define Polysaccharides
- Classify polysaccharides
- Describe functions of polysaccharides.

#### LIPID CHEMISTRY

- Define lipids, fatty acids
- Classify lipids, fatty acids, compound lipids
- Discuss the functions & biomedical importance of lipids
- Discuss the properties, functions & nutritional importance of fatty acids
- Discuss compound lipids
- Discuss the functions and biomedical importance of each (PL, LP, GL, Sphingo lipid)

#### PROTEIN CHEMISTRY

- Define plasma proteins
- Classify plasma proteins
- Describe the properties, functions and chemical reactions shown by amino acids
- Discuss the structure, function & biomedical importance of proteins
- Discuss the biomedical importance of simple proteins (plasma protein)

#### ENZYMES

- Define enzymes
- Classify enzymes.
- Discuss the structure, mechanism of action of enzymes & MM equation

- Discuss the factors affecting enzyme activity & regulation of enzyme activity
- Discuss the clinical significance of enzymes

#### NUCLEOPROTEINS

- Define nucleotides
- Discuss the chemical structure & significance of nucleoproteins
- Describe the chemical structure, properties and functions of DNA & RNA
- Discuss the central dogma of molecular biology

#### HEMOGLOBIN CHEMISTRY

- Discuss the structure, functions & types of hemoglobin
- Explain heme synthesis & its disorders
- Discuss the types, biochemical defects & clinical manifestation of hemolytic anemia (Thalassemia, Sickle cell Anemia etc:)
- Discuss Bilirubin synthesis, types and fate.
- Classify Jaundice & Liver Function Tests

#### VITAMINS

- Discuss the structure, functions, RDA(Recommended Dietary Allowance), sources & clinical abnormalities
- Discuss the structure, functions, RDA, sources & clinical abnormalities of: vitamins B12 & Folic acids, C and D

#### MINERALS

- Discuss the functions, RDA, sources, transport, storage & clinical importance of Iron, Calcium & Phosphorus
- Describe the functions, RDA, sources & biochemical role of fluoride & other important Minerals.

### CARBOHYDRATE METABOLISM

- Define glycolysis, gluconeogenesis
- Discuss the mechanism by which complex dietary carbohydrates are broken down to simple sugars & their absorption from GIT into portal blood
- Discuss the reactions involved in glycolytic pathway along with the fate of pyruvate formed from glucose
- Explain the reactions of citric acid cycle & its regulation.
- Discuss the reactions and its regulations
- Describe the formation and break down of glycogen & its regulation
- Describe the purpose, importance & reactions of Hexose Monophosphate Pathway.
- Discuss the normal blood glucose level, clinical significance of its variations & metabolic derangements that occur in Diabetes Mellitus

### LIPID METABOLISM

- Discuss the mechanism by which complex dietary lipids are broken down to simpler forms and their absorption from GIT.
- Explain the oxidation of fatty acid in the body to give energy
- Describe the synthesis & utilization of Ketone Bodies in the body.

### PROTEIN METABOLISM

- Discuss the mechanism by which dietary proteins are broken down into simpler forms & their absorption from GIT.
- Explain the reactions of amino acids & Ammonia Metabolism.
- Describe the metabolism of specific amino acids & its inborn errors (Phenylalanine & Tyrosine)

	<p><u>NUTRITION</u></p> <ul style="list-style-type: none"> <li>• Discuss the biomedical importance of nutrition</li> <li>• Discuss the importance of balanced diet</li> <li>• Summarize the clinical abnormalities associated with nutritional imbalance.</li> <li>• Discuss the importance of Body Mass Index(BMI)</li> <li>• Calculate BMI for males and females of different weight</li> </ul> <p><u>ENDOCRINOLOGY</u></p> <ul style="list-style-type: none"> <li>• Define hormones</li> <li>• Classify hormones</li> <li>• Discuss the general characteristics &amp; mechanism of action of hormones</li> <li>• Describe the chemistry, mechanism of action &amp; metabolic role of hormones from: hypothalamus, pituitary and thyroid glands, adrenal gland and pancreas</li> </ul> <p><u>NEUROTRANSMITTERS</u></p> <ul style="list-style-type: none"> <li>• Discuss the chemistry, biosynthesis, mechanism of action &amp; metabolic role of neurotransmitters</li> </ul>
<b>PRACTICALS</b>	<p>BY the end of the course, students will be able to perform and/ or discuss the following practicals:</p> <ol style="list-style-type: none"> <li>i. Lab Hazards &amp; Solutions</li> <li>ii. Detection of Carbohydrates</li> <li>iii. Detection of Proteins</li> <li>iv. Detection of Casein</li> <li>v. Detection of Albumin</li> <li>vi. Detection of Lipids</li> <li>vii. Colorimetry</li> <li>viii. Estimation of Glucose (By Kit &amp; Glucometer)</li> <li>ix. Estimation of Cholesterol by Kit Method</li> </ol>

	<ul style="list-style-type: none"> <li>x. Estimation of Protein by Kit Method</li> <li>xi. pH &amp; Tonicity</li> <li>xii. Normal Urine</li> <li>xiii. Pathological Urine (Ketone Bodies, Blood, Bile Pigments &amp; Bile Salts) Detection of normal hypoglycemic &amp; hyperglycemic graphs by GTT, L.F.Ts&amp; Bilirubin Estimation</li> <li>xiv. ALT Estimation by Kit Method</li> <li>xv. ALP Estimation by Kit Method</li> <li>xvi. Electrophoresis (Demonstration)</li> <li>xvii. Chromatography (Demonstration)</li> </ul>
<b>INTERNAL ASSESSMENT</b>	10% (Pre-professional Examination, Midterm Examination, Assignments and Class Presentations)
<b>ANNUAL EXAMINATION</b>	90% (MCQS, OSPE)
<b>COURSE EVALUATION</b>	This course will be evaluated as per JSMU & HEC policies