



**ALTAMASH INSTITUTE OF DENTAL MEDICINE  
(JINNAH SINDH MEDICAL UNIVERSITY)**

**BDS First Year  
Biochemistry  
Study Guide**

**Introduction:**

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.

**Outcomes:**

By the end of term students should be able to:

- Describe the structure, function, importance & properties of cell membrane, cell organelles, water & maintenance of acid base balance
- Describe the structure, functions & metabolic pathways of protein, lipids, carbohydrates & nucleic acids
- Communicate healthy diet plan and deficiencies of nutrition
- Apply knowledge and safe practices in the laboratory.

**Teaching and learning:**

1. Flipped Classroom (FC)
2. Interactive lectures (IL)
3. Tutorials
  - a. Case Based Discussion (CBD)
  - b. Small Group Discussion (SGD)

**Assessment tools:**

1. Multiple Choice Questions: ( MCQs )
  - One Correct Type
  - One Best Type
2. Short Answer Question (SAQ)
3. Observed structured practical examination (OSPE)



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<b>s.n o.</b>	<b>Topic</b>	<b>Course Objectives: By the end of the course, 1<sup>st</sup> year students will be able to:</b>	<b>Teaching method</b>	<b>Assessment Tool</b>
<b>1</b>	Biochemistry Of Cell	<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>	<b>IL</b>  <b>SGD</b>	<b>MCQs</b>
<b>2</b>	Carbohydrate Chemistry	<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> <li>• Describe various sources and biomedical importance of Mono- , Di- and Oligo- saccharides</li> <li>• Define Polysaccharides</li> <li>• Classify polysaccharides</li> <li>• Describe functions of polysaccharides.</li> </ul>	<b>IL</b>  <b>SGD</b>	<b>MCQs</b>
<b>3</b>	Lipid Chemistry	<ul style="list-style-type: none"> <li>• Define lipids, fatty acids</li> <li>• Classify lipids, fatty acids, compound lipids</li> <li>• Discuss the functions &amp; biomedical importance of lipids</li> <li>• Discuss the properties, functions &amp; nutritional importance of fatty acids</li> <li>• Discuss compound lipids</li> <li>• Discuss the functions and biomedical importance of each (PL, LP, GL, Sphingo lipid)</li> </ul>	<b>IL</b>  <b>SGD</b>  <b>IL</b>	<b>MCQs</b>
<b>4</b>	Protein Chemistry	<ul style="list-style-type: none"> <li>• Define plasma proteins</li> <li>• Classify plasma proteins</li> <li>• Describe the properties, functions and chemical reactions shown by amino acids</li> <li>• Discuss the structure, function &amp; biomedical</li> </ul>	<b>FC</b>	<b>MCQs</b> <b>SAQ</b>



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		<p>importance of proteins</p> <ul style="list-style-type: none"> <li>• Discuss the biomedical importance of simple proteins (plasma protein)</li> </ul>	<b>SGD</b>	
<b>5</b>	Enzymes	<ul style="list-style-type: none"> <li>• Define enzymes</li> <li>• Classify enzymes.</li> <li>• Discuss the structure, mechanism of action of enzymes &amp; MM equation</li> <li>• Discuss the factors affecting enzyme activity &amp; regulation of enzyme activity</li> <li>• Discuss the clinical significance of enzymes</li> </ul>	<b>IL</b>  <b>CBL</b>	<b>MCQs</b>
<b>6</b>	Nucleoproteins	<ul style="list-style-type: none"> <li>• Define nucleotides</li> <li>• Discuss the chemical structure &amp; significance of nucleoproteins</li> <li>• Describe the chemical structure, properties and functions of DNA &amp; RNA</li> <li>• Discuss the central dogma of molecular biology</li> </ul>	<b>IL</b>	<b>MCQs</b>
<b>7</b>	Hemoglobin Chemistry	<ul style="list-style-type: none"> <li>• Discuss the structure, functions &amp; types of hemoglobin</li> <li>• Explain heme synthesis &amp; its disorders</li> <li>• Discuss the types, biochemical defects &amp; clinical manifestation of hemolytic anemia (Thalassemia, Sickle cell Anemia etc:)</li> <li>• Discuss Bilirubin synthesis, types and fate.</li> <li>• Classify Jaundice &amp; Liver Function Tests</li> </ul>	<b>IL</b>  <b>CBL</b>	<b>MCQs</b>
<b>8</b>	Vitamins	<ul style="list-style-type: none"> <li>• Discuss the structure, functions, RDA(Recommended Dietary Allowance), sources &amp; clinical abnormalities</li> <li>• Discuss the structure, functions, RDA, sources &amp; clinical abnormalities of: vitamins B12 &amp; Folic acids, C and D</li> </ul>	<b>FC</b>  <b>CBL</b>	<b>MCQs</b>
<b>9</b>	Minerals	<ul style="list-style-type: none"> <li>• Discuss the functions, RDA, sources, transport, storage &amp; clinical importance of Iron, Calcium &amp; Phosphorus</li> <li>• Describe the functions, RDA, sources &amp; biochemical role of fluoride &amp; other important Minerals.</li> </ul>	<b>IL</b>	<b>MCQs</b>



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<b>10</b>	Carbohydrate Metabolism	<ul style="list-style-type: none"> <li>• Define glycolysis, gluconeogenesis</li> <li>• Discuss the mechanism by which complex dietary carbohydrates are broken down to simple sugars &amp; their absorption from GIT into portal blood</li> <li>• Discuss the reactions involved in glycolytic pathway along with the fate of pyruvate formed from glucose</li> <li>• Explain the reactions of citric acid cycle &amp; its regulation.</li> <li>• Discuss the reactions and its regulations</li> <li>• Describe the formation and break down of glycogen &amp; its regulation</li> <li>• Describe the purpose, importance &amp; reactions of Hexose Monophosphate Pathway.</li> <li>• Discuss the normal blood glucose level, clinical significance of its variations &amp; metabolic derangements that occur in Diabetes Mellitus</li> </ul>	<b>IL</b>          <b>CBL</b>	<b>MCQs</b>
<b>11</b>	Lipid Metabolism	<ul style="list-style-type: none"> <li>• Discuss the mechanism by which complex dietary lipids are broken down to simpler forms and their absorption from GIT.</li> <li>• Explain the oxidation of fatty acid in the body to give energy</li> <li>• Describe the synthesis &amp; utilization of Ketone Bodies in the body.</li> </ul>	<b>IL</b>	<b>MCQs</b>
<b>12</b>	Protein Metabolism	<ul style="list-style-type: none"> <li>• Discuss the mechanism by which dietary proteins are broken down into simpler forms &amp; their absorption from GIT.</li> <li>• Explain the reactions of amino acids &amp; Ammonia Metabolism.</li> <li>• Describe the metabolism of specific amino acids &amp; its inborn errors (Phenylalanine &amp; Tyrosine)</li> </ul>	<b>IL</b>       <b>CBL</b>	<b>MCQs</b>
<b>13</b>	Nutrition	<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>	<b>FC</b>	<b>MCQs</b>    <b>SAQs</b>
<b>14</b>	Endocrinology	<ul style="list-style-type: none"> <li>• Define hormones</li> <li>• Classify hormones</li> </ul>	<b>IL</b>	<b>MCQs</b>



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		<ul style="list-style-type: none"> <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>	<b>CBL</b>	
<b>15</b>	Neurotransmitters	Discuss the chemistry, biosynthesis, mechanism of action & metabolic role of neurotransmitters	<b>IL</b>	<b>MCQs</b>
<b>PRACTICALS</b> By the end of the course, students will be able to :			<b>Teaching method</b>	<b>Assessment Tool</b>
<b>1</b>	Lab Hazards	Discuss the lab hazards	<b>Lab Demo</b>	<b>OSPE</b>
<b>2</b>	Solutions	Perform: <ul style="list-style-type: none"> <li>• Detection of Carbohydrates</li> <li>• Detection of Proteins</li> <li>• Detection of Casein</li> <li>• Detection of Albumin</li> <li>• Detection of Lipids</li> </ul>		
<b>3</b>	Colorimetry	<ul style="list-style-type: none"> <li>• Discuss the basic concepts of colorimetry and its biomedical implication</li> </ul>		
<b>4</b>	Glucometer LP pH meter	<ul style="list-style-type: none"> <li>• Estimate of Glucose (By Kit &amp; Glucometer)</li> <li>• Estimate of Cholesterol by Kit Method</li> <li>• Estimate of Protein by Kit Method</li> <li>• pH &amp; Tonicity</li> </ul>		
<b>5</b>	Urine	<ul style="list-style-type: none"> <li>• Detect Constituents of Normal Urine</li> <li>• Detect Pathological Urine (Ketone Bodies, Blood, Bile Pigments &amp; Bile Salts)</li> <li>• Detect normal hypoglycemic &amp; hyperglycemic graphs by GTT, L.F.Ts&amp; Bilirubin Estimation</li> </ul>		
<b>6</b>	LFT	<ul style="list-style-type: none"> <li>• Estimate ALT by Kit Method</li> <li>• Estimate ALP by Kit Method</li> </ul>		
<b>7</b>	Electrophoresis	Discuss the basic concepts of Electrophoresis and its biomedical implication		
<b>8</b>	Chromatography	Discuss the basic concepts of Chromatography and its biomedical implication		



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**Reading Sources:**

**Text Books:**

- Textbook of Medical Biochemistry, MN Chatterjea, Rana Shinde. Jaypee (Latest Edition)
- Harper's Illustrated Biochemistry (Latest Edition)
- Lippincott Illustrated Reviews , Biochemistry (Latest Edition)

**Practical Lab:**

Lab demonstration and practical performance along with slide presentations of all techniques and tests help students to apply knowledge related to biochemistry .

**Internet resources:** With easy excess to digital library students will use internet resources with added time flexibility to enrich and update their knowledge and its application.

**Library:** It provides wealth of resources, space to study alone or in a group. It also provide world of books to discover and borrow.

**Assessment Criteria :**

**Knowledge:**

- MCQs (Multiple Choice Questions) are used to asses objectives covered in each module.
- A MCQS has a statement or clinical scenario followed by four options (likely answer).
- Students after reading the statement/scenario select ONE, the most appropriate response from the given list of options.
- Correct answer carries one mark, and incorrect 'zero mark'. There is no negative marking.
- Students mark their responses on an answer sheet provided by examination department.

**Skills:**

- OSPE: Objective Structured Practical Examination:
- Each student will be assessed on the same content and have same time to complete the task.
- Comprise of 12-25 stations.
- Each station may assess a practical tasks include practical skills and application of knowledge
- Stations are observed, interactive, application of knowledge based and rest.
- In Observed and Interactive Stations these will be assessed by internal or external examiners through structured viva or a task.



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- Application of knowledge Stations: it will be static stations in which there will be pictures, clinical scenarios with related questions for students to answer on the provided answer copy.
- Rests: It is a station where there is no task given and in this time student can organize his/her thoughts.

**AIDM Internal Assessment Policy**

Students will be assessed to determine achievement of learning objectives through the following:

- Midterm Examination will be scheduled on completion of half of the course
- Mock Examination will be scheduled on completion of whole course
- The method of examination comprises theory exam which includes MCQs, and practical examination by OSPE (Objective Structured Practical Examination).
- Student's behaviors and attitudes will be observed during all academic activities.

**Annual Examination:**

- Marks of both internal assessments will constitute 20% weightage as per JSMU policy.
- University Annual examination will be based on MCQs and OSPE.

**Attempts:**

There are 2 attempts in the third professional examination only. 2<sup>nd</sup> attempt is the supplementary examination which if not passed student has to repeat the year.

**Course Evaluation:**

- Pass/fail ratio of continuous and summative assessments will be evaluated.
- 75% attendance is mandatory to be eligible for annual professional examination
- Feedback will be taken
  - Regarding course from students and faculty
  - Student feedback regarding faculty
  - Faculty feedback of students



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**Course Faculty:**

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