



# Paramedical Program

Specialization	Medical Laboratories
Course Number	21107221
Course Title	Medical Biochemistry
Credit Hours	(3)
Theoretical Hours	(2)
Practical Hours	(3)



### **Brief Course Description:**

This course deals with structure and properties of biomolecules, such as amino acids, proteins, carbohydrates, lipids, and nucleic acids. The focus of this course will be on the relationship between protein structure and its biological function, generation and storage of metabolic energy, main metabolic pathways and their key steps. In addition, the role of phospholipids in determining the properties of biological membranes and their function will be discussed.

### **Course Objectives:**

Upon the completion of the course, the student should be able to:

- 1) The students will acquire knowledge and understanding of current concepts in the subject of the course and to develop critical thinking skills.
2. To learn the basic concepts governing protein structure, reactivity and regulation.
3. To understand how energy and essential nutrients are derived from foods, how these are stored and how these processes are regulated.
4. To have a general understanding of how and where essential polymers (e.g. DNA, RNA, proteins, and glycogen) and metabolites are synthesized.
5. To describe the molecular events which govern the growth of cells and the communication between them.
6. To explain the pathophysiology that results from the abnormal functioning of processes described in 2-5 above.
7. To understand how several clinically relevant techniques of molecular biology work.
8. To be able to apply biochemical principles to understanding new clinical scenarios.





## Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1	Introduction	<p>-Introduction: review of biomolecules, proteins, lipids, carbohydrates, nucleic acids.</p> <p>- Water balance &amp; pH .</p> <ul style="list-style-type: none"> <li>▪ Water balance and recommended intake</li> <li>▪ Blood volume and blood gases</li> <li>▪ Electrolytes (Na, K, Cl, P, Ca, Fe)</li> </ul>	
2	Enzymes, Mechanisms, and Control	<p>- The Michaelis-Menten model and the behavior of allosteric enzymes?</p> <p>- The models for the behavior of allosteric enzymes? (Concerted Model)</p> <p>- Phosphorylation of specific residues that regulate enzyme activity?</p> <p>- Zymogens, and how do they control enzyme activity?</p> <p>- Active-site events of an enzyme that affect the reaction mechanism? (The Mechanism of Chymotrypsin Action)</p> <p>- types of chemical reactions are involved in enzyme mechanisms</p> <p>- coenzymes</p>	



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3	Glycolysis	<p>-introduction</p> <ul style="list-style-type: none"> <li>- The overall pathway in glycolysis?</li> <li>-How is pyruvate metabolized anaerobically?</li> <li>- energy produced by glycolysis</li> <li>- How is glycogen produced and degraded?</li> <li>-How does gluconeogenesis produce glucose from pyruvate?</li> <li>- Carbohydrate metabolism control</li> <li>- pentose phosphate pathway Cycle?</li> </ul> <p>What is the energetics of the citric acid cycle, and how is it controlled?</p> <p>What is the glyoxylate cycle?</p>	
4	The Citric Acid Cycle	<ul style="list-style-type: none"> <li>-What role does the citric acid cycle play in metabolism?</li> <li>-What is the overall pathway of the citric acid cycle?</li> <li>-How is pyruvate converted to acetyl-CoA?</li> <li>-What are the individual reactions of the citric acid</li> <li>- Electron Transport and Oxidative Phosphorylation.</li> </ul>	
5	Lipid Metabolism	<ul style="list-style-type: none"> <li>- lipids catabolism</li> <li>- the energy yield from the oxidation of fatty acids- unsaturated fatty acids and odd-carbon fatty acids catabolism</li> <li>-What are ketone bodies?</li> <li>-How are fatty acids produced? (Brief pathway)</li> <li>-How is cholesterol produced?</li> </ul>	



6	Metabolism of Nitrogen & Nucleic Acids	<p>Metabolism of amino acids</p> <ul style="list-style-type: none"> <li>- amino acids synthesis</li> <li>- amino acid catabolism</li> <li>- The levels of structure in nucleic acids?</li> <li>- Covalent structure of polynucleotides?</li> <li>-Purines Metabolism</li> <li>-Pyrimidine metabolism</li> </ul>	
7	Practical part	<ul style="list-style-type: none"> <li>- Urine analysis</li> <li>-Clinically Significant Isoenzymes: <ul style="list-style-type: none"> <li>A. Lactate dehydrogenase (LD)</li> <li>B. Creatinine kinase (CK)</li> <li>C. Alkaline phosphatase (ALP)</li> <li>D. Alanine aminotransferase (ALT)</li> <li>E. Aspartate aminotransferase (AST)</li> <li>F. Amylase (AMS)</li> <li>G. Gamma glutamyl transferase (GGT)</li> <li>H. Lipase (LPS)</li> <li>I. Pseudocholinesterase(pCHe)</li> <li>J. prostatic acid phosphatase (PAP)</li> </ul> </li> <li>K. Glucose-6-phosphate dehydrogenase</li> </ul>	





**Evaluation Strategies:**

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Practical Exam	10%	--/--/----
	Final Exam	35%Theory 15%Practical	--/--/----

**Teaching Methodology:**

- ❖ Lectures
- ❖ Slides and posters
- ❖ Practice inside labs

**Text Books & References:**

**Reference**

1- M.K. Campbell and S. O. Farrell BIOCHEMISTRY, (2006), 5<sup>th</sup> Edition. Publisher: Thomson Learning, Inc., USA.

2- Michael L. Bishop et al. Clinical Chemistry, (2005) 5<sup>th</sup> Edition.



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