



University of Al Ameer



Faculty of Health and Medical Technologies

Department of

**Cardiac care and Emergency Medicine Technologies Department**

**Biochemistry**

Course Description

**Course Information**

Course Information				
<b>Course Title</b>	Biochemistry	<b>Course Delivery</b>		
<b>Course Code</b>		<b>Method</b>	<b>H/Week</b>	<b>Frequency</b>
<b>Credits</b>	2 Credits (1 Theory + 1 Practical)	<b>Theory</b>	2 hours	Weekly
<b>Course Type</b>		<b>Online Lecture</b>	-	-
<b>Course Level</b>	First Year / Level 1	<b>Lab</b>	2 hours	Weekly
<b>Semester of Delivery</b>	Second Semester	<b>Tutorial</b>		
<b>Administering Department</b>	Health and Medical Technologies	<b>Practical</b>	1 hour	Weekly
<b>Instructor</b>	Zainab Ali	<b>Seminar</b>		
<b>Version Number</b>		<b>Faculty</b>	Health and Medical Technologies	
		<b>E-mail</b>	<a href="mailto:E-mail@alameed.edu.iq">E-mail@alameed.edu.iq</a>	
		<b>Scientific Committee Approval Date</b>	Version Number	

## Brief Description

This course provides a comprehensive overview of clinical biochemistry, emphasizing the chemical structures, classifications, and biological properties of essential macromolecules—including carbohydrates, lipids, proteins, amino acids, enzymes, and vitamins. The curriculum highlights the physiological and clinical relevance of these biomolecules, aligning their biochemical pathways with diagnostic medical applications in human health and emergencies.

## Course Objective, Learning Outcomes and Indicative Contents

<b>Course Objective</b>	A comprehensive study of the biological structures, chemical properties, and medical significance of bio-macromolecules (carbohydrates, proteins, fats, enzymes, and vitamins).
<b>Course Learning Outcomes</b>	<ol style="list-style-type: none"><li>1. Classify major biomolecules, including carbohydrates, lipids, amino acids, and proteins, based on their chemical structures.</li><li>2. Explain the essential biological functions and physiological roles of macromolecules in the human body.</li><li>3. Describe enzyme characteristics, kinetics, factors affecting catalysis, and their clinical diagnostic significance.</li><li>4. Differentiate between fat-soluble and water-soluble vitamins, highlighting their biochemical roles and deficiency disorders.</li><li>5. Conduct standard biochemical laboratory tests safely to identify unknown carbohydrates, lipids, and proteins.</li><li>6. Correlate altered biochemical pathways and biomolecule concentration levels with clinical symptoms and emergency cases.</li></ol>
<b>Indicative Contents</b>	<p><b><u>Theory Lectures</u></b></p> <p><b>Lecture 1: Introduction to Biochemistry and Carbohydrates I [Lippincott]</b></p> <ul style="list-style-type: none"><li>○ Concept: Chemical structure and classification of monosaccharides.</li></ul>

## **Lecture 2: Carbohydrates II [Lippincott]**

- Concept: Structure and biological importance of disaccharides and polysaccharides.

## **Lecture 3: Amino Acids [Lippincott]**

- Concept: Classification of amino acids based on side-chain properties.

## **Lecture 4: Proteins I [Lippincott]**

- Concept: Structural organization levels (primary to quaternary) of proteins.

## **Lecture 5: Proteins II [Lippincott]**

- Concept: classification of proteins

## **Lecture 6: Midterm Theory Exam**

## **Lecture 7: Vitamins I [Lippincott]**

- Concept: Functions and clinical deficiency disorders of Vitamins A, D, E, and K.

## **Lecture 8: Vitamins II[Lippincott]**

- Concept: Biochemical roles of Vitamin B-complex and Vitamin C as coenzymes

## **Lecture 9: Lipids [Lippincott]**

- Concept: Chemical structure and physiological roles of fatty acids and triglycerides.

## **Lecture 10: Enzymes I [Lippincott]**

- Concept: Activation energy lowering and the mechanism of substrate binding.

## **Lecture 11: Enzymes II [Lippincott]**

- Concept: Factors influencing enzyme activity and their medical diagnostic utility.

## **Lecture 12: Nucleic Acids I [Lippincott]**

- Concept: Structural differences and building blocks of DNA and RNA molecules.

## **Lecture 13: Nucleic Acids II [Lippincott]**

- Concept: Classification of RNA molecules and clinical cases.

## **Lecture 14: Comprehensive Revision**

- Concept: Reviewing core topics and discussing sample exam questions

## **Lecture 15: Final Theory Exam.**

## **Lab. Lectures**

### **Lab 1** General Carbohydrate Tests [Lippincott]

- Molisch's Test
- Iodine Test

### **Lab 2** Carbohydrate Differentiation Tests [Lippincott]

- Benedict's Test
- Barfoed's Test

### **Lab 3** Carbohydrate Differentiation Tests [Lippincott]

- Bial's Test
- Seliwanoff's Test

### **Lab 4** General Amino Acid and Protein Tests [Lippincott]

- Ninhydrin Test
- Biuret Test

### **Lab 5** Specific Amino Acid and Protein Tests [Lippincott]

- Xanthoproteic Test
- Lead Sulfide Test

### **Lab 6:** Mid exam

**Lab 7** Specific Amino Acid and Protein Tests [Lippincott]

- The Rosenheim reaction
- Mil Hopkins-Cole test (For indole group)

**Lab 8** Specific Amino Acid and Protein Tests [Lippincott]

- Sakaguchi test (For guanidino group)
- Nitroprusside
- Test for cystine or cysteine (-S-S-and-SH radicals)

**Lab 9** Specific Protein Tests [Lippincott]

- Protein Precipitation Reactions
1. Precipitation by heavy metals
  2. Precipitation by alkaloidal reagents
  3. Heat

**Lab 10** Reaction of fatty acid [Lippincott]

1. Hydrolysis
2. Saponification

**Lab 11** General Lipid Tests [Lippincott]

- Solubility Test

**Lab 12** Lipid Tests [Lippincott]

- Unsaturation Test
- Test for Glycerol

**Lab 13** Lipid Tests [Lippincott]

- Reaction of soap
- Detection of cholesterol

**Lab 14** : macro molecule discussion

**Lab 15** Final Practical Examination

## Learning and Teaching Strategies

### Strategies

- Explanation of laboratory experiments and test procedures by the instructor.
- Practical performance of biochemical tests by students in the laboratory.
- Group discussion of test principles and expected results
- Observation and interpretation of color changes, precipitates, and other test results.
- Recording experimental observations and preparing laboratory reports.
- Providing guidance, supervision, and feedback throughout laboratory sessions.

# Course Evaluation

		Time Number	Weight (Marks)	Week Due															Relevant Learning Outcome													
				W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10				
<b>Formative</b>	Quizzes	-	10%																													
	Report	-	-																													
	Lab Report	-	10%																													
	Project	-	-																													
	Online Assig.	-	10%																													
	Onsite Assig.	-	-																													
	Seminar	-	-																													
<b>Summative</b>	Mid. Exam T		25%																													
	Mid. Exam L		15 %																													
	Mid. Exam P		-																													
	Final Exam T		35%	<b>Week 16</b>																												
	Final Exam L		25 %																													
	Final Exam P		-																													
<b>Total assessment</b>			100%																													

## Delivery Plan (Weekly Theory Syllabus)

	Material Covered
Week 1	Introduction of Biochemistry and Carbohydrates I
Week 2	Carbohydrates II (Structures, Functions, and Classification)
Week 3	Amino Acids (Structure, Properties, and Classifications)
Week 4	Proteins I
Week 5	Proteins II
Week 6	Midterm Theory Exam
Week 7	Vitamins I
Week 8	Vitamins II
Week 9	Lipids (Classification, Fatty Acids, and Biological Membranes)
Week 10	Enzymes I
Week 11	Enzymes II
Week 12	Nucleic Acids I
Week 13	Nucleic Acids II
Week 14	Comprehensive Revision
Week 15	Final Theory Exam

## Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	General Carbohydrate Tests (Molisch's Test, Iodine Test)
Week 2	Carbohydrate Differentiation Tests I (Benedict's Test, Barfoed's Test)
Week 3	Carbohydrate Differentiation Tests II (Bial's Test, Seliwanoff's Test)
Week 4	General Amino Acid and Protein Tests (Ninhydrin Test, Biuret Test)
Week 5	Specific Amino Acid and Protein Tests I (Xanthoproteic Test, Lead Sulfide Test)
Week 6	Mid exam

Week 7	Specific Amino Acid and Protein Tests II (Millon's Test, Protein Precipitation Reactions)
Week 8	Specific Amino Acid and Protein Test
Week 9	Specific Protein Tests
Week 10	Reaction of fatty acid
Week 11	General Lipid Tests I
Week 12	General Lipid Tests II
Week 13	General Lipid Tests III
Week 14	macro molecule discussion
Week 15	Final Practical exam

## Learning and Teaching Resources

	Title or Address	Available in the Library?
<b>Required Texts</b>	Ferrier, D.R. Lippincott Illustrated Reviews: Biochemistry. 7th Ed. Wolters Kluwer, 2017	Choose an item.
		Choose an item.
		Choose an item.
		Choose an item.
<b>Recommended Texts</b>	Rodwell, V.W. Harper's Illustrated Biochemistry. 31st Ed. McGraw-Hill, 2018	Choose an item.
		Choose an item.
<b>Websites</b>	<a href="http://www.ncbi.nlm.nih.gov">www.ncbi.nlm.nih.gov</a>	

## Grade Policy

<b>Class Participation</b>	Evaluation of student engagement during sessions
<b>Quizzes</b>	Short unannounced tests to check understanding
<b>Report</b>	-
<b>Lab Report</b>	Weekly evaluation of laboratory experimental results
<b>Project</b>	-
<b>Online Assig.</b>	-
<b>Onsite Assig.</b>	-
<b>Seminar</b>	-

<b>Mid. Exam Theory</b>	Written exam covering first half of theoretical lectures
<b>Mid. Exam Lab.</b>	Practical and written evaluation of lab skills
<b>Mid. Exam Practical</b>	Included in the Midterm Lab evaluation
<b>Final Exam Theory</b>	Comprehensive written examination at the end of semester
<b>Final Exam Lab.</b>	Final practical exam inside the laboratory
<b>Final Exam Practical</b>	Evaluation of practical performance and final spotting

## Grading Scheme

Group	Grade	التقدير	Marks %
<b>Success Group (50 - 100)</b>	<b>A – Excellent</b>	امتياز	90 – 100
	<b>B - Very Good</b>	جيد جدا	80 – 89
	<b>C – Good</b>	جيد	70 – 79
	<b>D – Satisfactory</b>	متوسط	60 – 69
	<b>P – Pass</b>	مقبول	50 – 59
<b>Fail Group (0 – 49)</b>	<b>Conditional Pass</b>	راسب (قيد القرار)	(45-49)
	<b>F – Fail</b>	راسب	(0-44)

## University Policy

### **Attendance Policy**

Students must attend all theoretical and practical sessions. Unjustified absences of 10% or more will result in a formal warning.

### **Academic Integrity**

Cheating on quizzes or laboratory exams will result in immediate failing grades and strict disciplinary action.

### **Laboratory Safety**

Wearing clean white lab coats and following medical chemical safety guidelines is mandatory and strictly enforced.