MODULE DESCRIPTION FORM

Module Information					
Module Title	Biochemistry	Module Delivery			
Module Type	Basic	Method	h/week	Frequency	
Module Code	MP304	Theory	3	14	
ECTS Credits	5	Lab	2	15	
SWL (hr/sem)	125				
Module Level	UG III	Semester of Delivery	1		
Administering Department	Medical Physics	College	College of Science		
Module Leader	Karar Sadiq Al-Ghanimi	e-mail	Karar.s.k@uowa.edu.iq		
Module Leader's Acad. Title	Asst. proof.	Module Leader's Qualification	Ph.D.		
Module Tutor	Zainab Abdel-Ilah Abbas Ashraf Hussein Saleh	e-mail	zaineb.a@uowa.edu.iq Ashraf.H@uowa.edu.iq		
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Scientific Committee Approval Date	1 – 9 - 2025	Version Number	1.0		

Relation with other Modules			
Prerequisite module	-	Semester	-
Co-requisites module	-	Semester	-

جامعة وارث الانبياء
كلية العلوم
قسم الفيزياء الطبية

Department Head Approval

Dean of the College Approval

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1. Define the fundamental concepts of biochemistry and explain its relevance to applied medical sciences. 2. Describe the biomedical importance of carbohydrates, emphasizing their structural and functional roles in human health. 3. Identify and classify lipids, explaining their structural diversity, physiological roles, and significance in disease states. 4. Explain the metabolism of lipids, including key pathways of synthesis, degradation, and their clinical correlations. 5. Outline the structural organization, classification, and biological significance of proteins, with reference to their role in maintaining normal physiological function. 6. Classify amino acids based on chemical structure and properties, and relate these properties to protein function and metabolism. 7. Discuss the structure, function, and classification of enzymes, highlighting their mechanisms of action, regulation, and clinical applications. 8. Explain the chemical structure and biological function of nucleic acids (DNA and RNA), with emphasis on genetic information storage and transmission. 9. Analyze the role of vitamins as essential biomolecules, their classification, biochemical functions, and consequences of deficiency. 10. Integrate biochemical knowledge to understand the molecular basis of health and disease, preparing students for further studies in medical and clinical sciences.

Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to 10. 1. Define the scope and principles of biochemistry and explain its role in applied medical sciences. 2. Differentiate between monosaccharides, disaccharides, and polysaccharides based on their chemical structures and classification. 3. Discuss the biomedical importance of carbohydrates, including their role in energy metabolism and disease 4. Classify lipids into major groups and describe their structural and functional characteristics. 5. Explain the key pathways of lipid metabolism (such as β-oxidation, lipogenesis, and cholesterol metabolism) and relate them to clinical conditions. 6. Identify the levels of protein structure (primary, secondary, tertiary, and quaternary) and explain their functional significance. 7. Classify amino acids according to their chemical properties and relate these properties to protein structure and metabolism. 8. Describe enzyme structure and classification, and analyze enzyme kinetics and regulation in physiological and pathological contexts. 9. Explain the structure and biological function of nucleic acids, with particular focus on DNA in genetic information storage and replication. Classify vitamins into fat-soluble and water-soluble groups, and evaluate their biochemical roles, dietary sources, and deficiency manifestations.
Indicative Contents	Theory Lectures 1. **Introduction to Biochemistry** **(2 hrs)** o Scope and importance of biochemistry o Biomolecules and their medical relevance 2. **Carbohydrates: Chemistry and Classification** **(2 hrs)** o Monosaccharides, disaccharides, polysaccharides o Structural features and classification criteria 3. **Biomedical Importance and Classification of Carbohydrates (2 hrs)** o Carbohydrates in energy and storage o Clinical and diagnostic significance 4. **Lipids** **(2 hrs)**

- General characteristics and functions
- Biological importance in health and disease

5. **Classification of Lipids** (2 hrs)
   - Simple, compound, and derived lipids
   - Lipoproteins and membrane lipids
6. **Metabolism of Lipids** (2 hrs)
   - β-oxidation and fatty acid synthesis
   - Cholesterol metabolism and clinical disorders
7. **Proteins** (2 hrs)
   - Levels of protein structure
   - Functional classification of proteins
8. **Structures of Amino Acids** (2 hrs)
   - General structure and side-chain variation
   - Essential vs non-essential amino acids
9. **Classification and Properties of Amino Acids** (2 hrs)
   - Polarity-based classification
   - Physical and chemical properties
10. **Enzymes** (2 hrs)
    - Properties and mechanisms of enzyme action
    - Factors affecting enzyme activity
11. **Structures and Classification of Enzymes** (2 hrs)
    - Enzyme structural organization
    - IUB enzyme classification system
12. **Nucleic Acids** (2 hrs)
    - DNA and RNA structure
    - Nucleotides and base pairing
13. **Biological Function of DNA** (2 hrs)
    - Replication, transcription, translation
    - Genetic information storage and transfer
14. **Vitamins** (2 hrs)
    - Fat-soluble and water-soluble vitamins
    - Biochemical functions and deficiency disorders

Lab. Lectures

1. **Carbohydrates**
   - General properties of carbohydrates
   - Common lab methods for carbohydrate analysis
2. **Classification of Carbohydrates**
   - Monosaccharides, disaccharides, polysaccharides in lab tests
   - Distinguishing reducing vs non-reducing sugars
3. **Detection of Carbohydrates**
   - Benedict's and Fehling's tests
   - Molisch's and Barfoed's reactions
4. **Determination of Reducing Sugars**
   - Quantitative Benedict's test

	○ Interpretation of color intensity 5. **Introduction of Proteins** ○ Principles of protein analysis in the lab ○ Overview of common protein tests 6. **Qualitative Tests for Proteins** ○ Biuret, Millon's, and Xanthoproteic tests ○ Detection of protein functional groups 7. **Classification of Amino Acids** ○ Laboratory basis for amino acid grouping ○ Chemical and structural properties 8. **Tests on Amino Acids** ○ Color reactions of amino acids ○ Detection of specific side chains 9. **Study of the Physical Properties of Proteins** ○ Solubility and precipitation tests ○ Heat denaturation of proteins 10. **Lipids** ○ General tests for lipids in solution ○ Physical properties of fats and oils 11. **Classification of Lipid** ○ Simple vs compound lipid tests ○ Identification of phospholipids and sterols 12. **Reactions of Fatty Acids** ○ Saponification and soap formation ○ Tests for unsaturation and rancidity 13. **Qualitative Tests for Lipids** ○ Solubility and emulsion tests ○ Detection of unsaturation (iodine/bromine test) 14. **Test for Fatty Acids and Triglycerides** ○ Acrolein test for glycerol ○ Spot test for triglycerides Mid Exam = 1hr Final Exam = 3hrs

	Total hrs = 125

Learning and Teaching Strategies	
Strategies	1. Lectures 2. Interactive Discussions 3. Case Studies 4. Research Projects 5. Collaborative Learning

Student Workload (SWL)			
Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4.2
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4.1
Total SWL (h/sem)	125		

Module Evaluation

		Time/Number		Weight (Marks)		Week Due	Relevant Learning Outcome
		TH	LAB	TH	LAB		
Formative Assessment	Quizzes	2	2	4	10	4,6,8,10	1,2,3,4,5,6,7,8,9,10
	Outsite assignment	1	1	2	10	7	All
	Insite Assignments	-	-	-	-	14	All
	Projects	1	6	4	10	3,6,9,12	All
Summative Assessment	Midterm Exam	1		10		7	
	Final Exam	3 hr		50		15	
Total assessment				100 Marks			

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Biochemistry
Week 2	Carbohydrates: chemistry and classification
Week 3	Biomedical importance and classification
Week 4	Lipids
Week 5	Classification of lipids
Week 6	Metabolism of lipids
Week 7	Mid. Exam
Week 8	Proteins
Week 9	Structures of amino acids
Week 10	Classification and properties of amino acids
Week 11	Enzymes
Week 12	Structures and classification of enzymes
Week 13	Nucleic acids
Week 14	Biological function of DNA
Week 15	Vitamins

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Carbohydrates
Week 2	Classification of carbohydrates
Week 3	Detection of carbohydrates
Week 4	Determination of reducing sugars
Week 5	Introduction of Proteins
Week 6	Qualitative tests for Proteins
Week 7	Amino acids
Week 8	Classification of amino acids
Week 9	Tests on Amino Acids
Week 10	Study of the physical properties of proteins
Week 11	Lipids
Week 12	Classification of lipid
Week 13	Reactions of fatty acid
Week 14	Qualitative Tests for Lipids
Week 15	Test for Fatty Acids and Triglycerides

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	- Lippincotts Illustrated Reviews: Biochemistry by Denise R. Ferrier	
Recommended Texts	-Harper,s Illustrated Biochemistry by Rodwell et al. -Practical Manual of Biochemistry by Sattanathan et al.	
Websites		

Grading Scheme				
Group	**Grade**	Mark	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	Excellent	90 - 100	Outstanding Performance
	B - Very Good	Very Good	80 - 89	Above average with some errors
	C - Good	Good	70 - 79	Sound work with notable errors
	D - Satisfactory	Fair / Average	60 - 69	Fair but with major shortcomings
	E - Sufficient	Pass / Acceptable	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	Fail (Pending)	(45-49)	More work required but credit awarded
	F – Fail	Fail	(0-44)	Considerable amount of work required

Note:

Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.