



مركز الاعتماد  
وإضمان الجودة  
ACCREDITATION & QUALITY ASSURANCE CENTER



**The University of Jordan**

**Accreditation & Quality Assurance Center**

**Course Syllabus**

**Course Name:**

1	Course title	Introductory Biochemistry for Medical Students
2	Course number	0501112
3	Credit hours (theory, practical)	2, theory
	Contact hours (theory, practical)	2, theory
4	Prerequisites/corequisites	Organic Chemistry
5	Program title	Doctor of Medicine
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Medicine
9	Department	Physiology and Biochemistry
10	Level of course	First Year
11	Year of study and semester (s)	First Year Summer Semester
12	Final Qualification	
13	Other department (s) involved in teaching the course	
14	Language of Instruction	English
15	Date of production/revision	December 2018/2019

#### 16. Course Coordinator:

*Office numbers, office hours, phone numbers, and email addresses should be listed.*

Dr. Nafez Abu Tarboush  
 School of Medicine, Third Floor  
 962-6-535-5000 (ext. 23414)  
[natarboush@ju.edu.jo](mailto:natarboush@ju.edu.jo), [nafeztarboush@yahoo.com](mailto:nafeztarboush@yahoo.com)

#### 17. Other instructors:

*Office numbers, office hours, phone numbers, and email addresses should be listed.*

Dr. Naif Karadsheh  
 Dr. Faisal Alkhatib  
 Dr. Mamoun Ahram  
 Dr. Diala Abu Hassan

#### 18. Course Description:

*As stated in the approved study plan.*

This two-credit hour course is mandatory for first-year medical students. The course is designed to introduce medical students to biochemistry via covering the basic concepts of structures and functions of macromolecules, detailed information of enzymes, their mechanisms of action, and their regulation. Cofactors critical for enzyme function and mechanism of actions. Clinical enzymology and isoenzymes. Major biochemical techniques used in research.

**19. Course aims and outcomes:****A- Aims:**

The overall objective is to: 1) Understand strong and weak acids and bases, 2) The concept of pH and pKa along with main physiological buffers and their actions, 3) Explain the chemical structures in relation to function of the macromolecules, 4) Appreciate catalytic power of enzymes, understand the mechanisms of their actions and identify factors that affect their activity, 5) Know the principles and applications of different biochemical techniques

**B- Intended Learning Outcomes (ILOs):** Upon successful completion of this course students will be able to ...

**A. Knowledge and Understanding:** Student is expected to

- A1- A. Knowledge and Understanding: Student is expected to
- A2- Differentiate the types and characteristics of non-covalent interactions
- A3- pH and buffers : Recall the concepts of acids, bases, amphoteric molecules, and ionization of water and weak acids
- A4- Apply the molecular expressions: molarity, normality, equivalence, pH, and pKa.
- A5- Know the chemical concept of different types of buffers, buffering capacity, midpoint, and titration.
- A6- Apply the Henderson-Hasselbalch equation and mechanisms of buffer actions.
- A7- List of physiological buffers and translate knowledge in normal and abnormal condition.
- A8- Review of basic organic chemistry and functional groups in biomolecules.
- A9- Definition of Carbohydrates
- A10- Chemistry of Carbohydrates
- A11- Importance of Carbohydrates
- A12- Classification of Carbohydrates (e.g. mono and disaccharides)
- A13- Important disaccharides and polysaccharides
- A14- Differentiate proteoglycans and glycoproteins and carbohydrates linked to blood groups.
- A15- Define lipids and importance of lipids.
- A16- Identify the classifications, drawing, structure, and function of lipids (fatty acids, triglycerides, waxes, phospholipids, glycolipids, and steroids).
- A17- Differentiate the basic mechanism of lipid transport in blood
- A18- Recall the complex structure of cell membranes
- A19- Define proteins
- A20- List amino acids
- A21- Differentiate the structure, isomerism, classes of amino acids
- A22- Identify the ionization states of amino acids
- A23- Know the concept of isoelectric point
- A24- List modified and specialized amino acids
- A25- Recall of features of peptide bond
- A26- Apply the concept isoelectric point of amino acids to polypeptides
- A27- Recall the four levels of protein structure
- A28- Differentiate the different secondary structures of proteins and their structural significance
- A29- Understand the formation of tertiary structure of proteins
- A30- Define quaternary structure
- A31- Know the concept of complex protein structures (glycoproteins, lipoproteins, phosphoproteins)
- A32- Apply the concepts of denaturation and renaturation to protein structure and function
- A33- Apply the previous information to pathological defects in protein formation
- A34- Recognize the different classes of proteins (fibrous, globular)
- A35- Discuss different proteins from each class I (mainly collagen, myoglobin, and hemoglobin) in connection to their function in light of previous knowledge
- A36- Define enzymes
- A37- Recall the general properties and functions of enzymes, ribozymes.
- A38- List the classes of enzymes and differentiate the reactions they catalyze
- A39- Recall the major features of active sites
- A40- Recall the concept of free energy and activation energy, transition state, abzymes.
- A41- Differentiate between holoproteins and apoproteins
- A42- Differentiate classes of cofactors
- A43- Define and list vitamins and understands their contribution in enzymatic reaction (coenzymes)
- A44- Identify the role of metals in enzyme activity of metal-activate enzymes

- A45- Define enzyme kinetics
- A46- Apply the concept of  $V_o$ ,  $V_{max}$ , and  $K_M$ , and their biological significance
- A47- Apply the above terms to the Michaelis-Menten equation
- A48- Apply the enzyme units to understand the following terms: (rate of reaction ( $V_o$ ),  $V_{max}$ , specific activity, turnover number).
- A49- Link the mechanisms of action of the different classes of inhibitors in relation o the Lineweaver-Burk or double-reciprocal plot
- A50- Describe how enzyme activity can be regulated by physiological and pharmacological inhibitors
- A51- Recall the concept of allosteric regulation
- A52- Identify the role of small and large enzyme regulatory molecules
- A53- Irreversible inhibition and suicide inhibition.
- A54- Define the various modes of enzyme regulation.
- A55- Discuss the effect of nonspecific inhibitors (temperature, pH) on protein structure and function
- A56- Define isoenzymes and know their biological and clinical significance (Clinical enzymology).
- A57- Application of centrifugation in cell fractionation.
- A58- Principal and applications of dialysis and gel filtration chromatography.
- A59- Various types of chromatography: ion exchange chromatography, affinity chromatography, HPLC.
- A60- Electrophoresis and isoelectric focusing.
- A61- Colorimeter.
- A62- Immunological and molecular techniques.

**B. Intellectual Analytical and Cognitive Skills: Student is expected to**

- B1- Calculate pH and changes in pH according to different variables
- B2- Predict changes in blood pH according to equilibrium of bicarbonate buffering system
- B3- Differentiate between the various sugar molecules, lipids, and amino acids
- B4- Calculate isoelectric point of small polypeptides
- B5- Predict changes in enzyme kinetics according to inhibitor type
- B6- Calculate enzyme units
- B7- Determine enzyme class according to catalyzed reaction and involved cofactor
- B8- Turn over number and specific activity.

**20. Topic Outline and Schedule:**

Topic	No. of lectures	Week	Reference	ILOs
Introduction	1	1	Campbell Chapter 1 1-5	A1
Acids, bases, pH, and buffers	5	1,2	Campbell Chapter 2 35-57	A2-6
Carbohydrates	3	2,3	Campbell Chapter 16 451-477	A7-13
Lipids	3	3	Boyer Chapter 8 231-258	A14-17
Amino acids	2	4	Campbell Chapter 3 61-79	A18-23
Polypeptides and protein structure	2	4	Campbell Chapter 3,4 83-117	A24-30
Protein structure-function relationship (part I: fibrous proteins)	1	5	Campbell Chapter 3,4 83-117	A31-34
Protein structure-function relationship (part II: globular proteins)	1	5	Campbell Chapter 3,4 83-117	A31-34
Enzymes (introduction)	2	5	Marks Chapter 8 112-133	A35-40
Enzymes (cofactors)	2	6	Marks Chapter 8 112-133	A41-43
Enzymes (kinetics)	2	6	Marks Chapter 9 112-133	A44-48
Enzymes (mechanism and regulation)	1	7	Marks Chapter 9 112-133	A49-55
Biochemical techniques	2	7	Campbell Chapter 5 117-135	A56-61

**21. Teaching Methods and Assignments:**

Development of ILOs is promoted through the following teaching and learning methods:

Lectures (100%)

**22. Evaluation Methods and Course Requirements:**

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Midterm Exam: 40%

Attendance: 10 %

Final exam: 60%

**23. Course Policies:**

Attendance policies:

Attendance is mandatory

B- Absences from exams and handing in assignments on time:

Make-up exam is given if absence is accepted by the deanship

C- Health and safety procedures:

None

D- Honesty policy regarding cheating, plagiarism, misbehavior:

Misbehavior is not permitted and is subjected to punishment according to university laws and regulations

E- Grading policy:

Exams are stored electronically

F- Available university services that support achievement in the course:

Lecture halls, computers, and data shows are provided

**24. Required equipment:**

Computers and data shows

**25. References:**

A- Required book (s), assigned reading and audio-visuals:

1- Biochemistry; Mary K. Campbell and Shawn O. Farrell, Brooks Cole.

2- Mark's Basic Medical Biochemistry, Smith, Marks and Lieberman, Lippincott, Williams and Wilkins.

B- Recommended books, materials, and media:

- NCBI Bookshelf:

(<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books>)

- The Medical Biochemistry Page: (<http://web.indstate.edu/thcme/mwking/home.html>)

- Biochemistry, Garret and Grishan, Second Ed.: <http://web.virginia.edu/Heidi/home.htm>

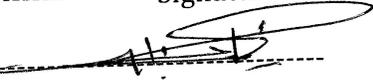
**26. Additional information:**

- Concerns or complaints should be expressed in the first instance to the module lecturer; if no resolution is forthcoming, then the issue should be brought to the attention of the module coordinator (for multiple sections) who will take the concerns to the module representative meeting. Thereafter, problems are dealt with by the Department Chair and if still unresolved the Dean and then ultimately the Vice President. For final complaints, there will be a committee to review grading the final exam.
- For more details on University regulations please visit:  
<http://www.ju.edu.jo/rules/index.htm>

Name of Course Coordinator: **Mamoun Ahram**

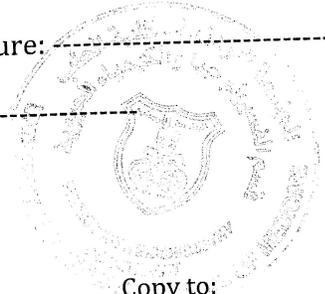
Signature: ----- Date 2022/2023

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: د. نائل سنان Signature: 

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- Signature: -----



Copy to:  
Head of Department  
Assistant Dean for Quality Assurance  
Course File