The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Course Name:

1	Course title	Biochemistry for Nursing
2	Course number	501104
3	Credit hours (theory, practical)	3
	Contact hours (theory, practical)	3
4	Prerequisites/corequisites	General chemistry
5	Program title	Nursing
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Medicine
9	Department	Physiology and Biochemistry
10	Level of course	Second level
11	Year of study and semester (s)	Second year and above (all semesters)
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. Mamoun Ahram
School of Medicine, First floor
962-6-535-5000 (ext. 23481)
m.ahram@ju.edu.jo, Dr.Ahram@gmail.com

17. Other instructors:

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

Faisal Al-Khateeb
Said Ismail
Nafez Abu Tarboush
Diala Abu Hassan

18. Course Description:

As stated in the approved study plan.

This three-credit hour course is mandatory for nursing students. The course is designed to introduce nursing students to biochemistry via reviewing general and organic chemistry, covering the basic concepts of structures and functions of macromolecules, discussing basic information of enzymes including their mechanisms of action and regulation, the critical cofactor critical for enzyme function, and their use in the clinic, describing major metabolic pathways, and presenting main concepts of molecular biology and its technologies.

19. Course aims and outcomes:

A- Aims:

The overall objective is to learn: 1) the structure of macromolecules and their building block, 2) enzyme function and their role in metabolism, and 3) concepts of molecular biology and uses of its technologies in the clinic.

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- List common and most critical elements in the human body.

A2- Differentiate the types and characteristics of non-covalent interactions.
A3- Know biochemical importance and properties of carbon and water.
A4- Recall the concepts of acids, bases, and amphoteric molecules, and ionization of water and weak acids.
A5- Apply the molecular expressions: molarity, normality, equivalence, pH, and pKa.
A6- Know the chemical concept of different types of buffers, buffering capacity, midpoint, and titration.
A7- Apply the Henderson-Hasselbalch equation.
A8- List of physiological buffers and translate knowledge in normal and abnormal condition.
A9- List major functional groups of organic compounds.
A10- Recall the chemical and physical properties and structures of the major functional groups of organic compounds.
A11- Know the main reactions involving the major functional groups of organic compounds.
A12- Know the concepts macromolecules of and how they are synthesized and broken down.
A13- Define carbohydrates.
A14- Recognize the classifications, drawing, structure, and function of carbohydrates (mono-, di-, oligo-, and poly-).
A15- Apply the concept of isomerism to monosaccharides.
A16- Identify substituted and modified saccharides (mono- and poly-).
A17- Differentiate proteoglycans and glycoproteins.
A18- Link carbohydrates to blood typing.
A19- Define lipids.
A20- Identify the classifications, drawing, structure, and function of lipids (fatty acids, triglycerides, waxes, phiospholipids, glycolipids, and steroids.
A21- Differentiate the basic mechanism and players of lipid transport in blood.
A22- Recall the complex structure of cell membranes and the function of the different components.
A23- Define proteins.
A24- List amino acids.
A25- Differentiate the structure, isomerism, classes of amino acids.
A26- Identify the ionization states of amino acids.
A27- Know the concept of isoelectric point.
A28- List modified and specialized amino acids.
A29- Recall the four levels of protein structure.
A30- Recall of features of peptide bond.
A31- Apply the concept isoelectric point of amino acids to polypeptides \.
A32- Differentiate the different secondary structures of proteins and their structural significance.
A33- Understand the formation of tertiary structure of proteins.
A34- Define quaternary structure.
A35- Know the concept of complex protein structures (glycoproteins, lipoproteins, phosphoproteins).
A36- Apply the concepts of denaturation and renaturation to protein structure and function.
A37- Apply the previous information to pathological defects in protein formation.
A38- Recognize the different classes of proteins (fibrous, globular).
A39- Discuss different proteins from each class I (mainly collagen, myoglobin, and hemoglobin) in connection to their function in light of previous knowledge.
A40- Define enzymes.
A41- Recall the general properties and functions of enzymes.
A42- List the classes of enzymes and differentiate the reactions they catalyze.
A43- Recall the major features of active sites.

A44- Recall the concept of free energy and activation energy.
A45- Define enzyme kinetics.
A46- Apply the concept of V_o, V_{max}, and K_M, and their biological significance.
A47- Link the mechanisms of action of the different classes of inhibitors .
A48- Know the role of the factor of diffusion (compartmentalization and enzyme complexing) in enzyme regulation.
A49- Describe how enzyme activity can be regulated by physiological and pharmacological inhibitors.
A50- Recall the concept of allosteric regulation.
A51- Identify the role of enzyme regulatory molecules.
A52- Comprehend the mechanisms of reversible and irreversible enzyme modification.
A53- Define modes of regulation.
A54- Discuss the effect of nonspecific inhibitors (temperature, pH) on protein structure and function.
A55- Define isoenzymes and know their biological and clinical significance.
A56- Identify the role of enzymes in clinical medicine.
A57- Differentiate between holoproteins and apoproteins.
A58- Differentiate classes of cofactors including vitamins.
A59- Define and list vitamins and understands their contribution in enzymatic reaction .
A60- Identify the role of metals in enzyme activity of metal-activate enzymes.
A61- Recall the means of generating biochemical energy through:.
  a. Citric acid cycle.
  b. Oxidative phosphorylation.
  c. Respiratory chain reaction.
A62- Recall the major metabolic pathways of carbohydrates including:.
  a. Glycolysis.
  b. Fate of pyruvate.
  c. Glycogenesis.
  d. Glycogenolysis.
  e. Gluconeogenesis.
A63- Identify the role of the different pathways in feeding, starvation, and fasting.
A64- Recall the major metabolic pathways of lipids (fatty acid synthesis and beta-oxidation of fatty acids).
A65- Recall the major metabolic pathways amino acids including urea cycle.
A66- Define nucleic acids and nucleotides.
A67- Identify the classifications, drawing, structure, and function of nucleic acids.
A68- Recognize the mechanism of DNA and RNA structure and synthesis and their physical properties.
A69- Explain the higher organization of DNA into chromosomes.
A70- Comprehend the mechanism of DNA replication.
A71- Recall the different major RNA molecules.
A72- Know the processes of transcription and translation in prokaryotes and eukaryotes.
A73- Get oriented of recombinant DNA technologies their use in diagnostics.

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- Link the main features, structures, and chemical reactions of discussed functional groups of organic compounds with the studied macromolecules.
B4- Differentiate between the various sugar molecules, lipids, and amino acids.
B5- Determine enzyme class according to catalyzed reaction and involved cofactor.

B6- Interpret basic data of recombinant DNA technologies.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Introduction, intermolecular forces, carbon, water	1	TBD	A1-3		12 (325-326) 5 (99-105; 117-121) 8 (209-214)
Acid and bases, pH, buffers, titration	1	TBD	A4-8		10
Introduction to organic chemistry: structure, properties & important reactions of hydrocarbons, alcohols, phenols, ethers, aldhyds, ketones, carboxylic acids & amines	2	TBD	A9-11		12-17
Carbohydrates: structures, classes, function	3	TBD	A12-18		22
Lipids: structure & classification, Fatty acids, Triglycerides, phospholipids, Glycolipids & cholesterol, cell membrane	4	TBD	A19-22		24
Amino acids and proteins: amino acids, protein structure, properties of proteins	5	TBD	A23-39		18
Enzymes: general properties of enzymes, classes, the effect of substrate & enzyme concentration on reaction	6	TBD	A40-A56		19

rate, enzyme inhibition & regulation of enzyme activity, enzymes in medicine					
Vitamins vitamins, minerals & trace elements in nutrition	7	TBD	A57-A60		19
Generation of Biochemical Energy: citric acid cycle & respiratory chain	7,8	TBD	A61		21
Carbohydrate Metabolism: digestion, glucose metabolism, glycolysis, glyconegenesis	9	TBD	A62-A63		23
Lipids Metabolism: digestion, absorption, transport, oxidation & biosynthesis of fatty acids, biosynthesis of cholesterol, ketoacidosis	10	TBD	A64		25
Protein and amino acid Metabolism: catabolism & of amino acids, urea cycles, amino acids conversion, synthesis of amino acids catabolism	11	TBD	A65		28
Nucleic acid and protein synthesis: heredity & the cell, structure of nucleic acids, RNA, genetic code translation	12	TBD	A66-72		26
Genomics Mapping human	13	TBD	A73		27

genome, chromosomes					

21. Teaching Methods and Assignments:

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

Lectures (1005)

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:
Exam I: 30%
Quiz: 20%
Final exam: 50%

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 scored electronically

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

Lecture halls, computers, and datashows are provided

24. Required equipment:

Computers and datashows

25. References:

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

Fundamentals of General, Organic & Biological Chemistry 5th Edition, by John McMurry & M.E.Castellion

B- Recommended books, materials, and media:

26. Additional information:

Name of Course Coordinator: **Mamoun Ahram** Signature: ---------- Date 2022/2023

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

Head of Department: ---------- Signature: ----------

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

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

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