Introduction To Biochemistry # 31501102 (2 Credit Hours) Summer Semester 2020

Lecturer : Dr. Nabil Amer (M.D., Ph.D.) Extn.# Location of Lectures: Lecture Hall 2 <u>Time</u> : Sunday,Monday & Wednesday from Gp 1 (9:15-10:30) . Gp 2 (10:30-11:45) <u>Office Hours</u> : Sunday, Monday, Tuesday 10-12 <u>e.mail</u> : namer@bau.edu.jo Course Description :

This course covers the relationship between organic chemistry & biochemistry. Acids, bases & buffers. It also covers the structure and classification of carbohydrates, amino acids, proteins and their classifications, lipids and membranes including receptors and signal transduction. Glycoproteins & proteoglycans.

Learning Objectives:

At the end of this course , the student will be able to:

- 1. Know the definition of acids, bases & buffer system.
- 2. Understand the different types of buffers in the body and the organs involved in regulation of blood pH.
- 3. Understand the structure of amino acids ,peptides and examples of important proteins such as myoglobin, hemoglobin & collagen.
- 4. Identify and explain the classification of carbohydrates and their role in living systems.
- 5. The structure and types of fatty acids ,membrane structure including receptors & signal transduction pathways.
- 6. Understand the structure & functions of glycoproteins and proteoglycans.

Text Book & References

- 1. <u>Biochemistry by Campbell & Farrell 7th. Ed. 2016</u>. <u>Brooks/Cole-</u> <u>Thomson</u>
- 2. Lippincott's illustrated reviews in Biochemistry by Ferrier. 7th Edition

Detailed Syllabus

Day & Date	Торіс	Chapter
Monday 18/6	Introduction	-
Wednesday 20/6	 What Makes Water a Polar Molecule? What Is a Hydrogen Bond? What Are Acids and Bases? What Is pH, and What Does It Have to Do with the Properties of Water? What Are Titration Curves? What Are Buffers, and Why Are They Important? 	2
Sunday 24/6	 Amino Acids & Peptides What are amino acids, and what is their three- dimensional structure? What are the structures and properties of the individual amino acids? Do amino acids have specific acid–base properties? What is the peptide bond? Are small peptides physiologically active? 	3
Monday 25/6 Wednesday 27/6	 The Three-Dimensional Structure of Proteins 1. How does the Structure of Proteins Determine Their Function? 2. What Is the Primary Structure of Proteins? 3. What Is the Secondary Structure of Proteins? 4. What Can We Say about the Thermodynamics of Protein Folding? 5. What Is the Tertiary Structure of Proteins? 6. Can We Predict Protein Folding from Sequence? 7. What Is the Quaternary Structure of Proteins? 8. Structure & characteristics of hemoglobin, myoglobin & collagen 	4

Sunday	Protein Purification and Characterization Techniques	5
1/7	1 How Do We Extract Pure Proteins from Cells?	2
1//	2 What Is Column Chromatography?	
	3 What is Electrophoresis?	
	1 How Do We Determine the Primary Structure of a	
	Protein?	
Monday	Carbohydrates	16
2/7	1 What Are the Structures and the	10
	Stereochemistry of Monosaccharides?	
	2 How Do Monosaccharides React?	
	3 What Are Some Important Oligosaccharides?	
	4. What Are the Structures and Functions of	
	4. What Are the Structures and Functions of Delyaceherides?	
XX7 1 1	Polysaccharides?	0
Wednesday	Lipids & Biological Membranes	8
4//	1. What is the Definition of a Lipid?	
Sunday	2. What Are the Chemical Natures of the Lipid	
8/ /	Types?	
	3. What Is the Nature of Biological Membranes?	
	4. What Are Some Common Types of Membrane	
	Proteins?	
	5 What Is the Fluid-Mosaic Model of Membrane	
	Structure?	
	6 What Are Some of the Functions of	
	Membranes?	
	7 Which And the Linid Calable With mine and	
	7. Which Are the Lipid-Soluble Vitamins, and	
	What Are Their Functions?	
	8. What Are Prostaglandins and Leukotrienes, and	
	What Do They Have to Do with Lipids?	
	9. Cholesterol Structure & properties	
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Monday	Revision (Discussion Questions & Answers)	
9/7	Kevision (Discussion, Questions & Allsweis)	
Wednesday	Revision (Discussion, Questions & Answers)	
11/7		
SUNDAY		50 %
15/7	Mid-Semester Exam Sunday	
Monday	Exam Revision & Feedback	
16/7		
Wednesday	Signal-Transduction Pathways: An Introduction to	H.O

18/7 Sunday 22/7	 Information Metabolism Principles of Signal Transduction Membrane receptors transfer information from the environment to the cell's interior Second messengers relay information from the receptor-ligand complex. Changes in the concentration of small molecules, called second messengers Protein phosphorylation is a common means of information transfer 	
Monday 23/7 Wednesday 25/7 Sunday 29/7	 1. 1.G-protein families and their functions 2. G Proteins Cycle Between GDP- and GTP- Bound Forms 3. G Proteins Spontaneously Reset Themselves Through GTP Hydrolysis 4. Cyclic AMP Stimulates the Phosphorylation of Many Target Proteins byActivation Protein Kinase A 5. The Hydrolysis of Phosphatidyl Inositol Bisphosphate by Phospholipase C Generates Two Messengers 6. Diacylglycerol Activates Protein Kinase C, Which Phosphorylates Many Target Proteins 7. Calcium Activates the Regulatory Protein Calmodulin, Which Stimulates Many Enzymes and Transporters 	H.O
Monday 30/7 Wednesday 1/8 Sunday 5/8	Glycoproteins BIOMEDICAL IMPORTANCE FUNCTIONS EIGHT SUGARS PREDOMINATE IN HUMAN GLYCOPROTEINS THE MAMMALIAN ASIALOGLYCOPROTEIN RECEPTOR	
	IS INVOLVED IN CLEARANCE OF CERTAIN GLYCOPROTEINS FROM PLASMA BY HEPATOCYTES THERE ARE THREE MAJOR CLASSES OF GLYCOPROTEINS GLYCOPROTEINS CONTAIN SEVERAL TYPES OF O-GLYCOSIDIC LINKAGES	

	Mucins Have a High Content of O-Linked	
	Oligosaccharides & Exhibit Repeating	
	Amino Acid Sequences	
	N-LINKED GLYCOPROTEINS CONTAIN	
	AN Asn-GlcNAc LINKAGE	
	Complex, Hybrid, & High-Mannose	
	Are the Three Major Classes	
	of N-Linked Oligosaccharides	
	The Endoplasmic Reticulum	
	& Golgi Apparatus Are the	
	Major Sites of Glycosylation	
	Several Factors Regulate the Glycosylation	
	of Glycoproteins	
	GLYCOPROTEINS ARE INVOLVED	
	IN MANY BIOLOGIC PROCESSES	
	& IN MANY DISEASES	
	Selectins Play Key Roles in Inflammation	
	& in Lymphocyte Homing	
Monday	Revision (Discussion, Questions & Answers)	
6/8		
Wednesday	Revision (Discussion, Questions & Answers)	
8/8		

Last Day of Teaching: 16/8Final Exams : 20-30/8 To be decided later