

INTER AMERICAN UNIVERSITY OF PUERTO RICO
METROPOLITAN CAMPUS
Department of Natural Sciences
Biomedical Sciences Program

SYLLABUS

I. GENERAL INFORMATION

Course Title : Biochemistry of Human Physiology
Code and Number : BMSC 4015
Credits : 3 credits
Code and Number :
Academic Period :
Professor :
Office Hours :
Office Phone :
e-mail :

II. DESCRIPTION

Study of metabolic transformations that chemical compounds and biopolymers undergo at cellular level. Physiological studies that include bioenergetics, vitamin and hormone metabolism, anabolism and catabolism of carbohydrates, lipids and proteins, production of energy through the cycle of tricarboxylic acid and oxidation phosphorylation. Prerequisite: CHEM 2222.

III. OBJECTIVES

At the end of the course, the student must:

1. Describe the molecular structures of the monomers that make up the Macromolecules.
 - 1.1 distinguish between the structures of the twenty common amino acids.
 - 1.2 diagram the molecular arrangement that results in the formation of a peptide bond.
 - 1.3 distinguish between monosaccharide, disaccharide and polysaccharide molecules.
 - 1.4 distinguish between types of glycosidic bonds.
 - 1.5 Describe the molecule of a fatty acid.
 - 1.6 recognize the structures of non-polar and polar lipids.
 - 1.7 describe the components of nucleic acid molecules
2. Describe the functioning of the enzymes.

- 2.1 define the terms K_m , V_{max} , "turnover number", and K_i .
 - 2.2 to recognize Lineweaver-Burk plot charts.
 - 2.3 distinguish between enzymes that obey the kinetics of Michaelis-Menten and others Which do not (allosteric enzymes).
 - 2.4 distinguish between types of enzymatic inhibition.
 - 2.5 identify the cofactors corresponding to each type of family of enzymes.
3. Understand the relationship between structure and function of biomolecules.
 - 3.1 distinguish between the molecular structures of peptides with biological activity (Hormones and antibiotics).
 - 3.2 explain the relationship between the levels of structure and biological function of protein.
 - 3.3 recognize the structural architecture levels in proteins.
 - 3.4 explain the role of lipids in biological membranes.
 - 3.5 explain the role of nucleic acids in cells.
4. Understand the chemical reactions that are important for sustaining life.
 - 4.1 mention the enzymes involved in the synthesis and degradation of glycogen.
 - 4.2 identify enzymes involved in glycolysis.
 - 4.3 mention the glycolysis reactions that result in the production of ATP.
 - 4.4 distinguish between glycolysis and gluconeogenesis in terms of the enveloped enzymes.
 - 4.5 relate biosynthesis to the oxidation of fatty acids.
 - 4.6 explain the importance of production of ketone bodies in diabetics
 - 4.7 explain how cholesterol is converted to bile acids.
 - 4.8 explain how lactate occurs during vigorous activity.
 - 4.9 diagram the different types of nitrogen compounds and their importance Physiological
 - 4.10 mention different ways of degradation of amino groups in amino Acids and their connection with urea formation.
 - 4.11 explain the relationship between nucleotide degradation and gout (accumulation of uric acid).
 - 4.12 relate the Krebs cycle to glycolysis, lipid metabolism, and Protein metabolism
5. Explain the flow of energy in the cells.
 - 5.1 Recognize the chemical reactions that occur in the metabolism.
 - 5.2 Understand the concept of free energy (G).
 - 5.3 Understand the basis of the energy function of the ATP molecule.
 - 5.4 Explain what is meant by coupled reactions.
 - 5.5 Explain the mechanism of oxidative phosphorylation

IV. CONTENT

Unit I: Nature and function of macromolecules

A. Peptides and Proteins

1. Structure and characteristics of amino acids to.
 - a. Amino acid classes
 - b. Modified Amino Acids
 - c. Stereo isomers
2. Methods used to detect the presence of amino acids.
3. Peptides of physiological importance
4. Proteins
 - a. Structure levels
 - b. Examples of proteins of physiological importance

B. Enzymes

1. Properties of enzymes
2. Classification of enzymes
3. Enzymatic kinetics
 - a. Kinetics of Michaelis-Menten
 - b. Lineaweaver-Burk mapping
 - c. Inhibition of enzymes
 - d. enzymatic regulation
4. Catalysis
 - a. Catalytic mechanism
 - b. Cofactors in enzymatic catalysis
 - c. Mechanism models

C. Structure and Characteristics of Carbohydrates

1. Monosaccharides
 - a. Structure of Monosaccharides
 - b. Methods used to detect the presence of monosaccharides
 - c. Examples of monosaccharides of physiological importance
2. Disaccharides
3. Oligosaccharides
4. Polysaccharides
 - a. Homopolysaccharides
 - b. Heteropolisaccharides

D. Lipids

1. Fatty acids and their derivatives

2. Triglycerides
3. Eicosanoids
4. Waxes
5. Phospholipids and sphingolipids
6. Terpenes and steroids
7. Steroids

E. Physiological applications of lipids

1. Membranes
2. Lipoproteins

Unit II: Metabolism of carbohydrates, lipids and nitrogen compounds

A. Carbohydrate Metabolism

1. Glycogen metabolism
2. Glucolysis
3. Gluconeogenesis

B. Lipid Metabolism

1. Oxidation of fatty acids
2. Fatty acid biosynthesis
3. Biosynthesis of ketone bodies
4. Cholesterol metabolism

C. Metabolism of Oxidation Products of Carbohydrates and Lipids

1. Cyclic acid cycle
2. Electron transport
3. Oxidative phosphorylation

D. Effects of physiological activity on carbohydrate metabolism

E. Nitrogen metabolism I: Synthesis

1. Biosynthesis of amino acids
2. Neurotransmitters

F. Nitrogen metabolism II: Degradation

1. Catabolism of amino acids
2. Disorders of amino acid catabolism
3. Cycle of urea
4. Degradation of neurotransmitters

5. Degradation of nucleotides and drop \

V. ACTIVITIES

- A. Lectures
- B. Collaborative works.

VI. EVALUATION

VII. SPECIAL NOTES

A. Auxiliary services or special needs

All students who require ancillary services or special assistance must request the same at the beginning of the course or as soon as they acquire knowledge that they need them, through the corresponding register, or you can communicate with the Auxiliary Coordinator to the telephone 787-250-1912, extension 2306, Mr. José Rodríguez or email jrodriguez@metro.inter.edu.

B. Honesty, fraud, plagiarism

Lack of honesty, fraud, plagiarism and any other inappropriate behavior in relation to academic work are major infractions sanctioned by the General Regulations of Students. Major infractions, according to the General Regulations of Students, may result in the suspension of the University for a definite time greater than one year or permanent expulsion from the University, among other sanctions.

C. Use of electronic devices

Cell phones and any other electronic device that could disrupt the teaching and learning processes or switch the driving environment to academic excellence were deactivated. The answers are correct, as appropriate. The handling of electronic devices that allow access, storage or sending of data during test evaluations is prohibited.

D. Compliance with the provisions of "Título IX "

The Federal Higher Education Act, as amended, prohibits discrimination on the basis of sex in any academic, educational, extracurricular, athletic or any other program or employment, sponsored or controlled by an institution of higher education regardless of whether it takes place inside or outside the institution's premises, if the institution receives federal funds.

As provided by current federal regulations, a Title IX Assistant Coordinator has been designated in our academic unit to provide assistance and guidance regarding any alleged incidents of discrimination based on sex or gender, sexual harassment or sexual assault.

You can communicate with the Auxiliary Coordinator Sr. George Rivera to the telephone 787-250-1912 extension 2262 or 2147, or email griverar@metro.inter.edu. The Normative Document entitled "Normas y Procedimientos para Atender Alegadas Violaciones a las Disposiciones del Título IX" is the document that contains the institutional rules for channeling any lawsuit that is filed based on this type of claim. This document is available on the website of the Inter-American University of Puerto Rico.

IX. RESOURCES AND DIDACTIC MATERIALS

A. Textbook

Concepts in Biochemistry, Rodney Boyer. 3ra edición. Brooks/Cole. 2006.

B. Supplementary Text

Biochemistry, Jeremy Mark Berg. 2002. W.H. Freeman.

Bioquímica, Jeremy Mark Berg. 2003. Editorial Reverté.

Fundamentals of Biochemistry, Donald Voet, Judith G. Voet y Charlotte W. Pratt. Wiley. 2002

Lehninger Principios de Bioquímica. 2001. Ediciones Omega.

Lehninger Principles of Biochemistry, Albert L. Lehninger. 2005. W.H. Freeman.

Medical Physiology: A cellular and molecular approach, Walter F. Boron, Emile L. Boulpaep. 2005. Elsevier-Health Science Division.

Principles of Biochemistry, Robert Horton, et.al. 2002. Prentice Hall.

Textbook of Biochemistry with Clinical Correlations, Thomas M. Devlin. 5th Edition. Wiley-Liss. 2002.