

**UNIVERSIDAD INTERAMERICANA DE PUERTO RICO RECINTO
METROPOLITANO
Science and Technology Faculty**

Natural Science Department

Syllabus

I. General Information

Course Title	General Biology I.
Code and Number	Biol. 1101
Credits	3 credits
Academic Term	_____
Professor	_____
Office Location and Hours	_____
Office Phone	(787) 250-1912 ext. 2323
Email	_____

II. DESCRIPTION

Study of the characteristics and organization of living organisms. Emphasis on the structure of the main macromolecules, cells, the cell cycle and their metabolic processes. Use of scientific reasoning for the study of biological processes.

III. OBJECTIVES

1.Explain the characteristics of organisms and levels of matter.

1.1 Identify the characteristics of living organisms.

1.2 Describe the hierarchy and levels of organization in nature, from the

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subatomic particles to the biosphere.

1.3 Distinguish between prokaryotic and eukaryotic cells.

1.4 Explain the meaning of the relationship between cell structure and its function.

1.5 Distinguish the kingdoms in which living organisms are grouped.

2. Apply scientific reasoning in the study of biological processes.

2.1 Recognize the steps of the scientific method.

2.2 Discussion of situations where ethical principles are applied in solving problems through the use of the Scientific Method.

2.3 Differentiate between inductive and deductive reasoning.

2.4 Recognize the influence of biology in modern society.

3. Relate chemical concepts to biological processes.

3.1 Describe the properties and functions of subatomic particles.

3.2 Identify the main chemical elements present in organisms.

3.3 Distinguish between the different chemical bonds and their properties.

3.4 Explain the characteristics of the water molecule.

3.5 Compare the composition and function of the main groups of organic macromolecules.

4. Relate the cellular ultrastructure with its function.

4.1 Explain the cell theory.

4.2 Compare prokaryotic and eukaryotic cells.

4.3 Compare animal and plant cells.

- 4.4 Describe the Fluid Mosaic Model of the cell membrane.**
- 4.5 Explain the mechanisms of transport across cell membranes.**
- 4.6 Identify the different classes of cell junctions.**
- 4.7 Recognize the mechanisms of cellular communication.**
- 5. Discuss the metabolic processes of the cell.**
 - 5.1 Define the forms of energy.**
 - 5.2 Explain the laws of thermodynamics that apply to biological systems.**
 - 5.3 Compare anabolism and catabolism.**
 - 5.4 Describe the chemical structure of ATP and explain its role in cellular metabolism.**
 - 5.5 Explain the structure and function of enzymes.**
 - 5.6 Describe the factors that affect enzyme activity.**
 - 5.7 Compare the aerobic and anaerobic routes of the catabolic process.**
 - 5.8 Compare the processes of respiration and photosynthesis.**
- 6. Explain the events of the cell cycle and mitosis.**
 - 6.1 Describe the phases of the cell cycle.**
 - 6.2 Describe the process of regulation of the cell cycle. 6.3 Compare the stages of mitosis.**
- 7. Demonstrate knowledge and understanding of the concepts of molecular, cellular, organismal biology, and metabolic processes to maintain homeostasis.**

IV. CONTENT

A. Concepts to define living organisms.

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- 1. Features**
- 2. Organization**
- 3. Classification of organisms**
 - a. Kingdoms**
 - b. Domains**
- 4. Diversity and unity in organisms.**

B. Scientific reasoning

- 1. Scientific method**
 - a. hypothesis**
 - b. prediction**
 - c. experiment**
- 2. Deductive vs. inductive**
- 3. Science and society**

C. Chemical foundations of organisms.

- 1. Chemical elements**
 - a. Atomic structure**
 - 1) Atomic number**
 - 2) Atomic weight**
 - 3) Mass number**
 - 4) Isotopes**
 - 5) Valencia**
 - b. Main elements**

- 1) Carbon**

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2) Hydrogen

3) Oxygen

4) Nitrogen

2. Compounds

a. Bond

1) Covalent

a. Polar

b. Nonpolar

2) Ionic

b. Weak interactions

1) Hydrogen bridges

2) Van der Waals forces

3. Relationship between molecular form and function

4. Water molecule

a. Formation of hydrogen bonds.

1) Capillarity

2) Adhesion

3) Surface tension

4) Cohesion

b. Specific heat and vaporization of water

c. Water Expansion as it cools

d. Solvent property

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1) Aqueous solutions

2) Molarity

e. Hydrophilic and hydrophobic substances

f. Dissociation of the molecule

1) Dissociation equation

2) Definition of pH

a. Mathematical equation

3) Definition of acids and bases

4) Implications of changes in pH

5) Buffer substances

a) Bicarbonate buffer system

5. Organic molecules and macromolecules.

a. Chemical nature of the carbon atom

1) Configuration and number of bonds.

2) Variations in the structure

a) Linear shapes

b) Branched shapes

c) Rings

d) Isomers

1) structural

2) geometric

3) enantiomers

3) Functional groups and their properties

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b. Condensation and hydrolysis reactions

1) Monomers and biological diversity

c. Biological functions of macromolecules

d. Macromolecules

1) Carbohydrates

a) Monosaccharides

b) Glycosidic bonds

c) Disaccharides

d) Polysaccharides

2) Lipids

a) Fats

1) Ester bond

2) Saturated

3) Unsaturated

b) Phospholipids

c) Steroids

3) Proteins

a) Amino acids

1) Classification of amino acids

a) Polar

b) Non-polar

c) Electrically charged

b) Peptide bond

c) Polypeptides

1) Conformation: primary, secondary, tertiary, and quaternary

2) Structural changes

4) Nucleic acids

a) Nucleotides

b) Phosphodiester bond

c) Polynucleotides: DNA, RNA

1. Watson and Crick model

2. Functions

D. The cell

1. Contributors to the cell theory

a. Robert hooke

b. Anthony van Leewenhook

c. Mathias Schleiden and Theodor Schwann

2. Cell types a. Prokaryotes

b. Eukaryotes

1) animal cell

2) plant cell

3. Intracellular structures

a. Function

b. Endosymbiotic theory

4. Cell membranes

a. Structure

1) Fluid mosaic pattern

b. Permeability and transport mechanisms

1) Factors affecting permeability

- a) Polarity**
- b) Size**
- c) Electrical loads**

2) Passive transport

- a) Diffusion**
- b) Facilitated diffusion**
- c) Osmosis**
- d) dialysis**

3) Active transport

a) Generation of electrochemical gradients

1. Sodium-potassium pump

2. Proton pump

b) Cotransport

4) Exocytosis

5) Endocytosis

- a) Phagocytosis**
- b) Pinocytosis**

c) Receptor-mediated transport

5. Intercellular junctions

a. Hermetic joints

b. Desmosomes

c. Opening joints

d. Plasmodesma

6. Cell communication

a. Types of communication: local and remote

b. Receivers

c. Signal transduction

d. Response to signals

E. Metabolic processes

1. Forms of energy

a. Potential

b. Kinetics

2. Energy transformations

a. First law of thermodynamics

b. Second law of thermodynamics

3. Free energy (G)

a. Exergonic reactions

b. Endergonic reactions

c. Energy coupling: role of ATP

4. Enzymes

a. Structure

b. Mechanism of action

c. Factors Affecting Enzyme Reaction

- 1) pH**
- 2) Temperature**
- 3) Enzyme and substrate concentration**
- 4) Inhibitors: competitive and non-competitive**

d. Regulation of enzyme activity

- 1) Allosteric regulation**
- 2) Feedback inhibition**
- 3) Cooperativity**

5. Cellular respiration

a. Oxidation-reduction reactions

b. Metabolism: catabolic and anabolic

c. Aerobic respiration

- 1) Glycolysis**
- 2) Acetyl-CoA formation**
- 3) Krebs cycle**
- 4) Electron transport chain**
- 5) Chemiosmosis**

d. Anaerobic respiration

e. Fermentation

- 1) Alcoholic**
- 2) Lactic**

6. Photosynthesis

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a. Light spectrum

b. Photosynthetic pigments and the thylakoid membrane

c. Light dependent reactions

1) Photosystems I and II

2) Photolysis

d. Carbon fixation reactions

1) Calvin cycle (C3)

2) Routes C4 and CAM

F. Cell cycle

1. Chromosomes

2. Interface: G1, S, G2

3. Mitosis: phases

4. Cell cycle checkpoints

5. Binary fission

V. ACTIVITIES

Lecture, reviews, test discussion.

VI. EVALUATION

Punctuation

% of the final grade

Partial exam I

100 point

20

Partial exam II

100 point

20

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Partial exam III	100 point	20
Final exam	100 point	20
Attendance and		
Complementary Activities	100 point	20
Total	500 point	100

VII. EDUCATIONAL RESOURCES

Text: Campbell BIOLOGY IN FOCUS. Urry, L. 2016. 2nd ed. Pearson /

Benjamin Cummings

ISBN 13: 978-0-321-96275-1 or ISBN 10: 978-0-321-96275-3

Electronic Resources

Campbell Biology in Focus web site: www.masteringbiology.com

Blackboard Platform: www.metro.inter.edu

VIII. SPECIAL NOTES

A. Ancillary Services or Special Needs

All students who require auxiliary services or special assistance must request them at the beginning of the course or as soon as they acquire knowledge of those they need, through the corresponding registry in the Office of the Professional Counselor, Dr. María de los Angeles Cabello, located in the University Orientation Program.

B. Honesty, fraud and plagiarism

Dishonesty, fraud, plagiarism and any other inappropriate behavior in relation to academic work constitute major infractions sanctioned by the General Student Regulations. Major offenses, as provided in the General Student Regulations, may result in suspension from the University for a defined period of more 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 interrupt the teaching and learning processes or alter the environment conducive to academic excellence will be disabled. Urgent situations will be addressed, as appropriate. The handling of electronic devices that allow accessing, storing or sending data during evaluations or exams is prohibited.

D. Compliance with the provisions of Title IX

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

In accordance with current federal regulations, our academic unit has appointed an Assistant Title IX Coordinator who will provide assistance and guidance in relation to any alleged incident that constitutes discrimination based on sex or gender, sexual harassment or sexual assault. You can communicate with the Assistant Coordinator, Mr. George Rivera, at the telephone number 787-250-1912, extension 2262 or 2147, or at the email griverar@metro.inter.edu.

The Normative Document entitled Norms and Procedures for Attending Alleged Violations of the Provisions of Title IX is the document that contains the institutional rules to channel any complaint that is presented based on this type of allegation. This document is available on the website of the Inter American University of Puerto Rico (www.inter.edu).

IX. EDUCATIONAL RESOURCES

Text

Campbell biology in focus. -Second edition / Lisa A. Hurry, Michael L. Cain, Steve A. Wasserman, and Peter V. Minorsky. Pearson. ISBN 978-0-321-96275-1

Electronic Resources

Campbell's Biology web site at: www.campbellbiology.com, ISBN-13 978-0-321-69707-3

X. BIBLIOGRAPHY

Brooker RJ, Widmaier EP, Graham LE, Stiling PD. (2011). Biology. 2nd ed. New York (NY): McGraw-Hill Co.

Solomon EP, Berg LR, Martin DW. (2010). Biology. 9th ed. Belmont (CA): Thomson Brooks / Cole.

Raven PH, Johnson GB, Losos JB, Mason KA, Singer SR. (2011). Biology. 9th ed. New York (NY): McGraw-Hill.

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