BIOLOGY I (BIO1101 AND BIO1101L)
SYLLABUS

NEW YORK CITY COLLEGE OF TECHNOLOGY **The City University Of New York**	School of Arts and Sciences **Department of Biological Sciences**

Course Information

Course title:	Biology I (Lecture and Laboratory)	
Course code:	BIO1101 and BIO1101L	
Credit Hours:	4 credit hours	
	3 hours lecture and 3 hours lab per week for 15 weeks	
Prerequisite:	CUNY proficiency in reading	
Text:	**Lecture**	"BIOLOGY" by S. Mader 10th Ed., McGraw Hill Publishers
	Lab	"General Biology I Laboratory Manual" by Bakewicz Raven, Moore, Vodopich and Enger, 1995. Custom publication for NYCTC by McGraw- Hill Companies. Wm. C. Brown Publishers, 1998
Course Description:	The fundamental principles of biology, focus on topics including taxonomy, structure, nutrition, reproduction, heredity, development and evolution. The concepts of molecular biology and DNA fingerprinting using representative plants and animals are introduced. The course also includes the use and care of the microscope.	

Grading Procedure (see Grading Policies for details)

Lecture: 60% Lab: 40%

The Lecture component will include at least 4 exams plus other assignments at the discretion of the instructor. The Lab component will include at least 6 quizzes and lab reports, at the discretion of the instructor.

Course Coordinators

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Course Description

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Learning Outcomes

Upon satisfactory completion of this course, the student will be able to:

1. Comprehend the principles of biology.
2. Appreciate the relationship of the other sciences to biology.
3. Understand the scientific method, its history and importance to society.
4. Describe the properties of carbon that make it the central component of organic compounds.
5. Compare the functions and chemical functional groups of the major groups of organic compounds: carbohydrates, lipids, proteins, and nucleic acids.
6. Demonstrate the special properties of water that support life.
7. Explain why the cell is the basic unit of life.
8. Compare and contrast properties of eukaryotic and prokaryotic cells.
9. Describe the structure and function of eukaryotic cell organelles.
10. Describe the fluid mosaic model of cell membrane structure in relationship to membrane function.
11. Explain the chemical structure of atp and its central role in metabolism.
12. Describe the relationship between enzyme properties and types and rates of chemical reactions.
13. Describe the processes of photosynthesis and the essential role of photosynthesis to all life
14. Describe aerobic cellular respiration and fermentations and the processes of cell respiration in the domains and kingdoms of life.
15. Describe the cell cycle and the process mitosis in cell division.
16. Describe the process of meiosis and the importance of meiosis in life cycles and sexual reproduction.
17. Relate the contributions of mendel to inheritance and solve inheritance problems using mendel's principles.
18. Describe the chemical and physical features of dna.
19. Relate the contributions of griffith, avery, franklin, watson and crick and others to our knowledge that dna is the molecule of life and the to the structure of dna.
20. Discuss the significance of chromosomes in inheritance and the transmission of genetic information from generation to generation.
21. Outline the flow of genetic information in cells, from dna to rna to protein and how this process may be controlled.
22. Explain the scientific origins of biotechnological developments and evaluate the ecological, social, cultural, personal and ethical implications of those developments.

23. Explain why evolution is the central theme of all biology.
24. Explain how genetic variation and selection are the basis for evolution in a given environment.
25. Use various laboratory techniques, including compound and dissecting microscopes, and gel electrophoresis.
26. Use biology laboratory equipment and techniques correctly to observe specimens and perform experiments.
27. Develop the general skills (e.g., observation, problem solving, hypothesis generation and testing) used in science.
28. Gain skill in the collection of data and in its mathematical treatment and interpretation;
29. Develop expertise in the written and oral expression of biological ideas;
30. Acquire the knowledge needed for a thorough understanding of the major bioethical issues in society.

Lecture Schedule

Basics
- Definition, Characteristics and Hierarchy of Life
- Ecosystems and Populations
- The Scientific Method
- Classification and Naming

Origin and Evolution of Life
- Evolution
- The Origin of Life
- The Geological Time Scale
- Cellular History
- Kingdoms and Domains

Inorganic Chemistry I
- Definition, Classification and Properties of Matter and Energy
- Chemical Reactions: Exergonic and Endergonic Reactions
- Activation Energy
- Atomic Structure and The Periodic Table
- Oxidation and Reduction
- Electrons and Energy

Inorganic Chemistry II
- Elements, Compounds, Molecules and Mixtures
- Bonds: Weak and Strong

Water & pH
- Importance and Properties of H2O
- Acids, Bases, pH, Buffers

Organic Chemistry
- Importance of Carbon
- Organic vs. Inorganic Compounds
- The Hydrocarbons
- Functional Groups
- Isomers

Examination I (Lectures 1-6 inclusive)

Macromolecules I
- Monomers and Polymers
- Dehydration Synthesis and Hydrolysis
- Carbohydrates
- Lipids

Macromolecules II
- Proteins
- Enzymes and Metabolic Pathways
- Nucleic Acids
- ATP

Cells
- The Cell Theory
- Methods of Studying Cells
- Cellular Size Limitations
- Cellular Composition
- Prokaryotic and Eukaryotic Cells
- Cellular Evolution
- Viruses, Bacteria and Archaea

The Eukaryotic Cell
- Eukaryotic Cell Structure and Function

Membranes and Transport
- Membrane Structure and Function
- Passive Transport Processes
- Active Transport Processes
- Cell Surface Modifications

Examination II (Lectures 8-12 inclusive)

Energy

- Cells and the Flow of Energy
- Metabolic Reactions and Energy Transformations
- Metabolic Pathways
- Organelles and the Flow of Energy

Cellular Respiration I

- Cellular Respiration (Anaerobic)
- Outside the Mitochondria: Glycolysis
- Fermentation

Cellular Respiration II

- Cellular Respiration (Aerobic)
- Citric Acid Cycle
- Electron Transport Chain
- Metabolic Pool

Photosynthesis I

- Photosynthetic Organisms
- The Process of Photosynthesis
- Plant as Solar Energy Converters: Light Reactions

Photosynthesis II

- Calvin Cycle Reactions
- Other Types of Photosynthesis

Asexual Reproduction

- The Cell Cycle and Its Control
- Mitosis and Cytokinesis
- The Cell Cycle and Cancer
- Prokaryotic Cell Division

Sexual Reproduction

- Halving the Chromosome Number
- Genetic Variation
- The Phases of Meiosis
- Comparison of Meiosis and Mitosis
- The Human Life Cycle (Spermatogenesis & Oogenesis)
- Life Cycles

Examination III (Lectures 14-20 inclusive)

Genetics I

- Gregor Mendel
- Mendel's Law
- Human Genetics Disorders

Genetics II

- Extending the Range of Mendelian Genetics
- Multiple Allelic Traits
- Incomplete Dominance
- Pleiotropy
- Polygenic Inheritance
- X-Linked Inheritance

Chromosomes

- Changes in Chromosome Number and Structure

DNA

- The Genetic Material
- DNA Structure
- DNA Replication
- Prokaryotic versus Eukaryotic Replication

Gene Function

- The Genetic Code
- Transcription
- Translation

	• Structure of the Eukaryotic Chromosome
	Gene Regulation • Prokaryotic • Eukaryotic • Regulation Through Mutations **Biotechnology and Genomics** • DNA Cloning • Biotechnology Products • Gene Therapy • Genomics
	Animal Development • Early Developmental Stages • Developmental Processes • Human Embryonic and Fetal Development **Examination IV (Lectures 22-29 inclusive)**

ACADEMIC INTEGRITY POLICY STATEMENT

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

COLLEGE POLICY ON ABSENCE/LATENESS

A student may be absent without penalty for 10% of the number of scheduled class meetings during the semester as follows:

Class Meets	**Allowable Absence**
1 time/week	2 classes
2 times/week	3 classes
3 times/week	4 classes

Students are responsible for making up any missed work on days that they are absent. If a student's class absences exceed this limit the instructor will alert the student that a grade of WU may be assigned. Unless otherwise indicated by the instructor, two times late is treated as one absence.

Laboratory Schedule

	The Microscope: Basic skills **The Origin of Life (time permitting)** • Prepare microspheres • Stain Eukaryotic cheek cells
	pH Determination: Acids, Bases, Buffers and Coacervates
	Amino Acid Chromatography (theory) **Separation of dye molecules** **Measurements in Science: Metric System**
	Biologically Important Molecules I • Carbohydrates • Lipids
	Biologically Important Molecules II • Proteins • Nucleic Acids • Enzymatic Purification of DNA • Dische's Test
	Quantitative Determination of Proteins **Colorimetry**
	Enzyme Kinetics
	Membranes and Biological Transport • Diffusion and Osmosis • Active Transport (theory)
	Cellular Respiration: Anaerobic and Aerobic
	Photosynthesis
	Field Trip to Brooklyn Botanic **Gardens/ Writing Assignment**
	Principles of Electrophoresis **Restriction Enzyme digestion and DNA Fingerprinting**
	Mitosis: Replication of Eukaryotic Cells **Meiosis: Reduction Division and Gametogenesis**
	Genetics Problems • Human Variations (for reference and practice) • Single Factor Inheritance • Double Factor Inheritance • Human Variations (for reference and practice)

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Grading Policies

Students' performance on this course will be evaluated as follows:
Lecture: 60% of final grade (based on 4 exams)
Lab: 40% of final grade, based on 6 quizzes (75% overall) and lab work (25% overall)

ASSIGNMENTS		POINTS
There are 6 quizzes, which will account for 75% of the final lab grade.	Quiz 1	5%
	Quiz 2	5%
	Quiz 3	5%
	Quiz 4	5%
	Quiz 5	
	Quiz 6	5%
Lab report		10%
Exam 1		15%
Exam 2		15%
Exam 3		15%
Exam 4		15%
Total		**100%**

Letter grades will be determined using a standard percentage point evaluation as oined below:

A: 93-100
A-: 90-92.9
B+: 87-89.9
B: 83-86.9
B-: 80-82.9
C+: 77-79.9
C: 70-76.9
D: 60-69.9
F: Below 60

Percentage Category:	
Lecture Exams	60%
Laboratory Quizzes	30%
Lab Report	10%