

DEPARTMENT OF BIOLOGY
MEDGAR EVERS COLLEGE of the CITY UNIVERSITY OF NEW YORK

SYLLABUS
BIO 201 * GENERAL BIOLOGY I**

TEXTBOOKS:

1. Lecture Textbook: Campbell, N. A., and J. B. Reece. 2005. Biology, 7th ed., Benjamin Cummings
2. Lab textbook: Dolphin, W. D. 2002. Biological Investigations-Form, Function, Diversity, and Process (6th Ed.), McGraw-Hill, NY

COURSE DESCRIPTION:

This is the first part of the two-semester course for science majors. It will cover introduction to the fundamental principles of life processes of organisms including chemical basis of life, cell structure, function, cellular energetics, cell division, genetic and molecular basis of life and evolution. The laboratory component of this course will reinforce the biological principles by hands-on experiments.

COURSE GOALS/ OBJECTIVES:

The Goals of this course:

To provide students a basic foundation of biology so that they can proceed to a higher level of biological inquiry. Expose students with challenging learning experiences which explore varied responses to the human condition, develop the skills to facilitate analytical inquiry, promote global awareness, encourage social consciousness, foster creativity, analytical and problem solving skills that are essential for professional competencies in the student's chosen career.

The Objectives of this course are:

- A. The use of scientific method in observation and analysis of living organisms and their environment.
- B. The use of classification skills in ordering and sequencing the information in nature.
- C. Experience in oral and written communication. The student will have opportunities to describe biological processes and reaction and explain meaningful arrangements of biological information.
- D. Experience in skills in relating the biological theory to real life situation, comparing human activities that affect the natural environment.

EXPECTED OUTCOMES:

At the completion of this course, students will be able to identify and understand different biological processes and their interrelationships, the basis of continuity of life, the interaction between organisms and their environments, and the impact of DNA science and biotechnology on our society. They should have sufficient background preparation for upper level courses, such as ecology, evolutionary biology, genetics, cell and molecular biology and biotechnology.

METHODOLOGY:

Instruction methods will include lecture, lab experiments and observation, audiovisual material, computer assignments, group assignments, quizzes and major exams. Field trips may also be included.

COURSE REQUIREMENTS:

1. Regular and punctual attendance of lecture and lab.
2. No cheating or plagiarism will be tolerated.
3. Maintaining class discipline
4. Usually no make-up tests will be available
5. Late submission of assignments is unacceptable
6. Consecutive absence of more than twice the class meets in a week will result in grade of "F"

COURSE EVALUATION:

Departmental Mid-term	25%
Departmental Final	25%
Class tests, Assignments etc.	50%
Total	100%

Lecture Grade: Total score/100X60

Final Grade : Lecture (60%) + Lab. (40%)

Grading Scale: 97-100 = A+; 93-96.9 = A; 90-92.9 = A-; 87.1-89.9 = B+; 83-87 = B; 80-82.9 = B-; 77.1-79.9 = C+; 73-77 = C; 70-72.9 = C-; 67.1-69.9 = D+; 63-67 = D; 60-62.9 = D-; 00-59.0 = F.

A grade of "D" is not acceptable toward a degree at Medgar Evers College.

BIBLIOGRAPHY

Books:

Raven, P.H. and Johnson, G.B. 2005. Biology (Seventh ed.), WCB/McGraw-Hill Company, New York.

Freeman, S. 2005. Biological Science (second edition). Prentice Hall., New Jersey.

Parves, S., and O. Heller. 2004. Life-the Science of Biology. Sinauer Associates Inc.

BIO 201

LECTURE TOPICS AND ASSIGNMENTS

TOPICS

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|------------------------|--|--------------|
| 1. | Course Outline;
Characteristics of life
Scientific method | Ch 1 |
| 2. | Carbon and the Molecular Diversity of Life
Structure and Function of Macromolecules:
carbohydrates, lipids,
proteins and nucleic acids | Ch 4
Ch 5 |
| 3. | Cell structure and function:
Cell size and shape, cell theory
Methods of Studying cells
Cellular components and their functions
Plant cells vs. animal cells
Prokaryotic vs. Eukaryotic cells | Ch 6 |
| 4. | Membrane structure and function
Transport across membranes | Ch 7 |
| 5. | Introduction to metabolism
Metabolism, Energy and Life
Enzymes
Metabolic controls
Assignment 1 | Ch 8 |
| 6. | Cellular respiration | Ch 9 |
| 7. | Photosynthesis
Assignment 2 | Ch 10 |
| 8. | Cell cycle, Mitosis and its importance | Ch 12 |
| 9. | Meiosis and sexual life cycles
Mitosis vs. Meiosis
Assignment 3 | Ch 13 |
| MID-TERM TEST : | | |
| 10. | Genetics:
a. Patterns of inheritance
b. Chromosomes and Human heredity
c. Genetics problem solving
Assignment 4 | Ch 14, 15 |

11. Molecular Basis of Inheritance:
a. DNA is the genetic material
b. DNA structure and replication & repair Ch 16
12. From gene to protein:
a. Transcription and RNA processing
b. RNA types and functions
c. Genetic code and translation of mRNA into protein Ch 17
13. Genetics of Bacteria and Virus and Control of Gene expression:
a. Lac operon
b. Tryptophen operon
c. Eukaryotic gene expression Ch 18, 19
14. Genetic engineering and Biotechnology:
a. Restriction enzymes and their use
b. Gene cloning
c. Genomic and cDNA libraries
d. Nucleic acid probes and their use
e. Polymerase chain reaction
f. DNA fingerprinting
g. Gene therapy
h. Stem cell technology
Assignment 5 Ch 20, 38
Internet resources
15. Mechanisms of Evolution:
a. Gene variation in population
b. Natural selection and evolution
c. Evidence of evolution-selected examples
d. Speciation Ch 22-25

FINAL EXAM :

BIOL 201**LABORATORY SESSIONS AND TOPICS****LAB REQUIREMENTS:**

For your own safety and protection, lab coat must be worn in the lab. Each lab session has an assigned reading in the lab manual. Lab reports are due at the beginning of the next session. Attendance is required. **No make-up lab and lab test are available.**

LAB EVALUATION: (Lecture 60%; Lab 40%)

Lab Test 1	100
Lab Test 2	100
<u>Lab Reports</u>	<u>100</u>
<i>Total</i>	<i>300</i>

Lab Grade: (your total score/300)x 40

Lab Session 1***Lab safety, measurements and use of microscopes.***

- A. Safety in the Laboratory
- B. Metric and English Conversions: units of length and mass.
- C. Techniques in Microscopy: parts, care and use of microscopes
- D. Measurements of Objects: view fields, calibration of oculometer, size determination of an object (letter "e" and EM photographs).
- E. Lab Report 1 (due next session)

Lab Session 2:

- A. Perform chemical tests to identify of sugar, starch, protein and vitamin C
- B. Lab Report 2

Lab Session 3***Cellular Structure and Function.***

- A. Prokaryotic Cell Morphology
 1. Bacterial cells
- B. Plant Cells
 1. Onion epidermal cells (wet mount)
- C. Animal Cells
 1. Human cheek cells (wet mount)
 2. Observe fixed slides of a nerve cell, human sperm cells, blood cells.
 3. Observe fixed slides of tissues (muscle, epithelial, etc. - only 1 required).
- D. Lab Report 3

Lab Session 4

How Do Materials Enter Cells

1. Simultaneous osmosis and diffusion
2. Measurement of rate of osmosis using an Osmometer.
3. Study of plasmolysis in red onion skin cells
4. Lab Report 4

Lab Session 5

Enzyme Properties

1. Use of spectrophotometer
2. Determine optimum extract concentration for enzyme function (Tables 6.1 & 6.2)
3. Determine the effects of temperature on enzyme function (Tables 6.3 & 6.4)
4. Determine the effects of pH on enzyme function (Tables 6.5 & 6.6)
5. Determine the effect of boiling the extract on enzyme action (Table 6.7 & 6.8)
6. Determine the effect of inhibitor on enzyme action (Table 5.9 & 6.10)
7. Lab Report 5

Lab Session 6

Cellular Respiration.

1. Respiration in Yeast — BioKit
2. Aerobic Respiration in Peas
3. Preparing graphs based on data collected
4. Lab Report 6

Lab Session 7

Photosynthesis

1. Demonstration of leaf anatomy from permanently fixed slides
2. Extraction of chlorophyll from spinach leaves and study of its light absorption characteristics.
3. Separation of plant pigments by paper chromatography.
4. Effects of light Intensity on Photosynthetic Rate
5. Preparing graphs of absorption spectrum and photosynthetic rate
6. Lab Report 7

Lab Session 8 : LAB TEST 1:

Lab Session 9

Mitosis

1. Mitosis video/slide presentation
2. Preparation of onion root tip slides and study of mitosis in root tip cells.
Identify Prophase, Anaphase, Metaphase, Telophase
3. Complete table 8.1 from the information provided in the handout.
4. Prepare a histogram of data in Table 8.2.
5. Prepare human karyotype
6. Demonstration of the process of mitosis with chromosome models
7. Lab Report 8

Lab Session 10

Meiosis and Genetics

1. Study stages of meiosis (handouts)
2. Measuring the frequency of cross-over in *Sordaria*
3. Study of genetic segregation in corn ears and Chi square testing
4. Lab Report 9

Lab Session 11

DNA Experiments

1. Isolation of Genomic DNA from onion or Animal tissue or Bacteria
2. Agarose gel electrophoresis and DNA size determination.
3. Transformation of bacterial cells with Plasmids
4. Lab Report 10

Lab Session 12

Study of bacteria

1. Effect of household chemicals on bacterial growth
2. Differential Growth of Bacteria
3. Bacterial Population Counts
4. Gram staining (*Bacillus* and *Pseudomonas*)
5. Fixed slides: Cyanobacteria, Bacterial shapes
6. Lab Report 11

Lab Session 13: Review

Lab Session 14: LAB TEST 2