

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

**SYLLABUS**  
**BIO 491 \*\*\* CELL BIOLOGY**

**Textbook:** Essential Cell Biology, 2<sup>nd</sup> edition (2004) by Alberts *et al.*  
Publishers: Garland Science, NY ISBN 0-8153-3480-X

**Lab Book:** Labs will come from Modern Biology, Inc. and Selected Handouts.

**COURSE DESCRIPTION:**

BIO 491 is a lecture and laboratory study of the cell and its ultrastructure. It is geared towards Biology and other Science majors. Topics include the biochemistry of cellular compounds; cellular metabolism & energetics; cellular physiology; and the structure and function of both membranous and non-membranous organelles. Students who register for BIO 491 must also register for BIOL 491, which is the laboratory part of the course. The course carries 4 credits and meets six hours a week (3 hours lecture and 3 hours lab).

*Prerequisite:* completion of a 300 level biology course with a lab

*Pre/Corequisite:* CHM 303

**GRADING:**

The student's final grade for BIO 491 will be determined as follows:

3 LECTURE EXAMS:	50 %
TERM PAPER:	10 %
POWERPOINT PRESENTATION:	10 %
LAB WORK & PARTICIPATION:	15%
LAB NOTEBOOK:	<u>15 %</u>
	100 %

At the end of the semester, the marks for all aspects of the course will be added up to determine the student's final course grade. A letter grade will be assigned to BIO 491 and a "P" or "F" will be assigned to BIOL 491. Students earning an "F" grade for BIO 491 will automatically be assigned an "F" grade for BIOL 491.

**BIO 491****LECTURE TOPICS****Week****Topics****Chapters**

1.	Course objective Introduction to cells Chemical components of Cells: Chemical bonds	1 & 2
2.	Chemical Components continued: Cellular Macromolecules. Energy, Catalysis and Biosynthesis: Photosynthesis/cellular respiration, Redox reactions, Enzymes, Free energy changes, Activated carrier molecules	2 & 3
3.	How cells obtain energy from food. Glycolysis and the Citric Acid cycle	13
4.	Energy Generated in Mitochondria and Chloroplasts: Mitochondria and Oxidative Phosphorylation	14
5.	Exam #1	
*****		
6.	Energy Generated in Mitochondria and Chloroplasts continued: Chloroplasts and Photosynthesis	14
7.	Membrane Structure: The lipid bilayer; roles of membrane proteins; the Glycocalyx	11
8.	Membrane Transport: carrier proteins and their functions	12
9.	Membrane Transport continued: ion channels and the membrane potential; ion channels and signaling in nerve cells	12
10.	Exam #2	
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11.	Intracellular Compartments and Transport: Membrane bound organelles; protein sorting; vesicular transport	15
12.	Intracellular Compartments and Transport continued: Secretory and Endocytic Pathways	15
13.	Cell Communication: Principles of Cell Signaling; G-protein-linked receptors; enzyme-linked receptors	16
14.	The Cytoskeleton:	17
15.	FINAL EXAM	

## LABORATORY TOPICS

## BIOL 491

### LABORATORY SESSION 1

Chromatographic Separation of Proteins

Separating Molecules by Gel Filtration.....EXP. B3-C #1

Gel Filtration Chromatography

Determination of the Molecular Weight of Hemoglobin.....EXP B3-C #2

### LABORATORY SESSION 2

Chromatographic Separation of Proteins

Separating Molecules by Gel Filtration.....EXP. B3-C #1

Gel Filtration Chromatography

Determination of the Molecular Weight of Hemoglobin.....EXP B3-C #2

### LABORATORY SESSION 3

Use of a gel filtration assay to examine the binding

specificity of serum albumin to various dyes.....EXP B3-C #3

Use of gel filtration and immunological techniques to

determine the size and amount of ovalbumin .....EXP B3-C # 5

### LABORATORY SESSION 4

Theoretical and Practical Aspects of Electrophoresis

Electrophoretic Separation of Proteins according to charge..... EXP S1-C #101

Comparison of the Electrophoretic pattern of Hemoglobin A and S ..... EXP S1-C #102

### LABORATORY SESSION 5

Theoretical and Practical Aspects of Electrophoresis

Analysis of cow serum proteins..... EXP S1-C #103

Comparison of Human and Bacterial Amylase ..... EXP S1-C #105

### LABORATORY SESSION 6

Theoretical and Practical Aspects of Electrophoresis

Protein Fingerprinting

Analysis of LDH isoenzymes from different animal species..... EXP S1-C # 106

### LABORATORY SESSION 7

Use of SDS Gel Electrophoresis to determine the molecular

weight of proteins..... EXP S2-C #201

**BIO 491 TOPICS - continued**

LABORATORY SESSION 8

Peptide Mapping Analysis using SDS gel electrophoresis..... EXP S2-C #204

LABORATORY SESSION 9

Comparison of Serum Proteins from Different Mammals  
using SDS gel electrophoresis followed by Western blotting Analysis..... EXP S2-C #205

LABORATORY SESSION 10

Introduction to Cell Fractionation  
Chloroplast Isolation from Spinach & Determination  
Of the Sedimentation Coefficient.....HANDOUT

LABORATORY SESSION 11

Cell Fractionation continued  
Isolation of the Nuclear & Mitochondrial Fractions  
Of Cauliflower.....HANDOUT

LABORATORY SESSION 12

Rat Liver Fractionation - the five fraction scheme  
Isolation of the nuclear, heavy & light mitochondrial,  
microsomal and soluble fraction ..... HANDOUT

LABORATORY SESSION 13

Rat Liver Fractionation continued

LABORATORY SESSION 14

POWERPOINT PRESENTATION OF TERM PAPER TOPIC