

**BOROUGH OF MANHATTAN COMMUNITY COLLEGE**

City University of New York

**Department of Science**

**Title of Course BIOLOGY I**  
**BIO 210 Section \_\_\_\_\_**

**Credits 4**

**Class hours 3**  
**Lab hours 3**  
**Instructor Information**  
**Name:**  
**Office:**  
**Room:**  
**Email:**

**Course Description**

This is the first semester of a one-year course that acquaints students with the basic properties of living systems: metabolism, growth, energy transformation, cellular reproduction, classical, and molecular genetics.

**Prerequisites/Co-requisites**

**Student Learning Outcomes**

1. Students will be able to understand the designation of the cell as the unit of life by studying its functions.
2. Students will be able to develop an understanding of the scientific method by performing hands-on experiments, and to use critical thinking to solve problems.
3. Students will be able to learn how plant cells capture light energy and then transform it into chemical energy, which is utilized by all eukaryotes to synthesize ATP.
4. Students will be able to obtain an understanding of DNA as the genetic material, with emphasis on DNA replication, cell division, protein synthesis, mutation and inheritance.
5. Students will be able to understand the principles of science that underlies recent advances in biotechnology (cloning, genetic engineering), and to be able to critically analyze and discuss ethical, legal and social aspects of the impact of these advances on our lives.
6. Students will be able to acquire the information and skills that will enable students to be successful in the second semester (BIO 220) of this one-year introductory biology course.

**Required Text & Readings**

*Biology, 7<sup>th</sup> Edition, 2005*, Authors: Campbell, Neil & Reece, Jane.  
(ISBN 0-8053-7170-0); packaged with the Study Guide & CD-ROM and with access to website:  
[www.campbellbiology.com](http://www.campbellbiology.com)

*For the laboratory you need: Laboratory Outlines in Biology VI 1999*  
(ISBN 0-7167-2633-5)

My Biology 220 section is \_\_\_\_\_

It meets on \_\_\_\_\_ at \_\_\_\_\_ in room \_\_\_\_\_

\_\_\_\_\_ at \_\_\_\_\_ in room \_\_\_\_\_

Laboratory is on \_\_\_\_\_ from \_\_\_\_\_ to \_\_\_\_\_  
in room N-637

### Other Resources

### Use of Technology (if applicable)

### Evaluation & Requirements of Students

Instructor will administer four to six examinations. Students will be required to submit reports for all laboratory experiments. A term paper may be assigned at the instructor's discretion.

### Outline of Topics

#### LECTURE SYLLABUS

<u>WEEK</u>	<u>TOPIC</u>	<u>CHAPTER (S)</u>
1.	<b>GENERAL THEMES IN THE STUDY OF LIFE</b> Properties of living things Classification: prokaryotes and eukaryotes Evolution, Natural Selection Scientific process of inquiry; Application to society; biotechnology	1
	<b>BASIC CHEMISTRY</b>	2
	Elements and atoms (atomic number; atomic mass; isotopes) Compounds and Chemical bonds: ionic, covalent, hydrogen bonds	
	<b>WATER, pH scale</b>	3
2.	<b>BIOLOGICAL CHEMISTRY</b> Carbon bonding and functional groups <b>Macromolecules:</b> Carbohydrates; lipids; proteins, nucleic acids Amino acids: building blocks of proteins, Proteins: structural organization; functions	4 5
3.	<b>CELL STRUCTURE AND FUNCTION</b> Prokaryotic and Eukaryotic cells: Animals and Plants <b>Structure of the plasma membrane;</b> a phospholipid bilayer <b>The Nucleus</b> is the genetic message center (chromosomes; nucleoli; nuclear membrane) Cytoplasmic organelles enclosed by a plasma membrane (Golgi apparatus; Endoplasmic reticulum, smooth and rough; vacuoles; lysosomes) Ribosomes: protein-synthesizing factories Energy related organelles-(chloroplasts and mitochondria) Cytoskeleton (microtubules and microfilaments) Membrane attachment between cells, communication between cells	7 8 7
4.	<b>CELLS AND THEIR MEMBRANES</b> Structure and functions of biological membranes	7

	How molecules cross membranes-diffusion and osmosis (hypotonic hypertonic, isotonic solutions); transport by membrane proteins; active transport; endocytosis, exocytosis	
<b>5.</b>	<b>ENERGY AND LIFE: METABOLISM</b> Energy Transformations; Thermodynamics (89-90) Transferring Energy in Cells: Endergonic and Exergonic Reactions ATP and ADP (phosphorylation and dephosphorylation, 94-95) Enzymes and their functions (96-101)	<b>8</b>
<b>6.</b>	<b>PHOTOSYNTHESIS</b> Chloroplast structure (grana, thylakoids, photosystems, stroma) Electromagnetic spectrum Light Dependent Reactions: Photosystems I & II (P680 & P700) (photolysis of water, oxygen release, proton gradient) Chemiosmosis and ATP generation Light Independent Reactions (Calvin-Benson Cycle) Calvin-Benson cycle and CO <sub>2</sub> fixation; Generation of PGAL and production of glucose Evolution of photosynthesis (534-535) Effect of Deforestation on Global Warming (1218-1220)	<b>10</b>
<b>7.</b>	<b>FOOD AS A FUEL: CELLULAR RESPIRATION</b> Oxidation-Reduction reactions Glycolysis and Fermentation (anaerobic-lactic acid and ethyl alcohol) Breakdown of glucose into pyruvic acid Acetyl Coenzyme A as an intermediate Citric Acid Cycle (decarboxylation and dehydrogenation reactions) Role of Coenzymes The Respiratory Chain-cytochromes and electron transfer ATP production: proton gradient and chemiosmosis	<b>9</b>
<b>8, 9</b>	<b>THE CELL CYCLE</b> Mitotic division results in two identical cells Phases (G1, S, G2, Mitosis) Chromosome structure: DNA packing in Prophase (See Ch. 19:359-361.) S Phase: DNA replication (See CH. 16:299-306). Comparison between plant and animal cell mitosis Cell cycle: Importance of control Cancer and the cell cycle	<b>12</b>
	<b>MEIOSIS: cell division to create sex cells</b> crossing over in prophase I and random assortment in metaphase I Reduction of diploid chromosome number to haploid Human spermatogenesis and oogenesis Comparison between meiosis and mitosis.	<b>13</b>
<b>10</b>	<b>MOLECULAR GENETICS</b> Evidence that DNA is the genetic molecule (Griffith, Avery et al., Hershey) Helical and Antiparallel Structure of DNA (Watson and Crick, Chargaff, Franklin) Semiconservative Replication of DNA (Meselson and Stahl) Mechanism of DNA replication (This subject can be covered with the cell cycle.)	<b>16</b>
<b>11</b>	<b>RNA AND PROTEIN SYNTHESIS</b> Function of DNA as genes	<b>17</b>

Reading the Code

Transcription-differences between eukaryotes and prokaryotes:

Direct messenger RNA vs. splicing to form mRNA

Translation-transfer RNA (anticodons bond to codons in mRNA)

Initiation, elongation, termination; Roles of ribosomes

Information flow: the Central Dogma-DNA-RNA-protein;

Retroviruses (like HIV) flow this way: RNA-DNA-RNA-protein

Mutations: changes in genes

**12 RECENT ADVANCES IN DNA AND BIOTECHNOLOGY 20**

*(topics covered as time permits)*

Cloning genes; restriction enzymes; cutting, splicing and inserting DNA;

Gel Electrophoresis; Application of DNA replication (Polymerase ChainReaction-PCR);

DNA finger printing (Restriction Fragment Length Polymorphisms-RFLP)

Treating human diseases (gene therapy)

Recombinant DNA technology (drugs, plants)

What lies ahead as the Human Genome has been sequenced? (Microarrays)

**13, 14 MENDELIAN GENETICS 14**

Mendel’s first and second laws of inheritance

Dominant and recessive alleles

Genetic terms: genotype, phenotype, homozygous, heterozygous,

mono-hybrid cross, test cross, dihybrid cross,

incomplete dominance, Punnett square

Human genetic diseases (Tay-Sachs, sickle cell disease,

cystic fibrosis, Huntington’s disease, albinism)

Polygenic inheritance and multiple alleles

**CHROMOSOMES AND INHERITANCE 15**

Sex-linked genes,

chromosomal mutations

Linkage and crossing over in Drosophila;

**LABORATORY SYLLABUS**

<u>WEEK</u>	<u>EXPERIMENT TITLE</u>	<u>EXPERIMENT NUMBER</u>	<u>REMARKS</u>
1	Orientation and Metric System	Handout	
2	Biological Molecules Carbohydrates	1B	Carbohydrates
3	Biological Molecules – Proteins	1A1	Proteins; Amino Acid Model
4	The Microscope and The Organization of Cells	2A,B,C; 3B1, 2	<b>Film – “The Cell Part 2”</b>
5	Procaryotes	14A1, 2, 3	<b>Bacteria Micoslides</b>
6	Movement Across The Cell Membrane	6A,C	
7	Plant Anatomy	20A2, B2, 3, 5, 21A	Plants, flowers, slides
8	Photosynthesis	9A, C1, 2	Film – “Photosynthesis”
9	Cellular Respiration	8A,B	Spectronic 20
10	Cellular Reproduction - Mitosis	5A	Mitosis models
11	Cellular Reproduction – Meiosis	5B	Pipe cleaners; Models of Meiosis

12	DNA Transformation	Handout	
13	DNA Fingerprinting	Handout	
14	Human Genetics	12A,B	Taste papers CD-ROM (Saunders) Discovering Biology
15	Review and Final Exam		

### **College Attendance Policy**

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

### **Academic Adjustments for Students with Disabilities**

Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

### **BMCC Policy on Plagiarism and Academic Integrity Statement**

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web side, [www.bmcc.cuny.edu](http://www.bmcc.cuny.edu). For further information on integrity and behavior, please consult the college bulletin (also available online).