

This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

BOROUGH OF MANHATTAN COMMUNITY COLLEGE
The City University of New York
Department of Science

BIOLOGY I
BIO 210 Sec. _____
Spring 2019
Credits 4

Lecture hours: 3
Lab hours: 3
6 hours total

Instructor Information (Phone#, Office#, email) _____

Course Description

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

Basic Skills Requirements

ENG 095, ESL 095, ACR 095, MAT 051

Prerequisites/Co-requisites:

ENG 101 is a co-requisite

Course Student Learning Outcomes (Students will be able to...)	Measurements (means of assessment for student learning outcomes listed in first column)
1. Students will be able to explain the designation of the cell as the unit of life by studying its structure and functions.	1. Quizzes and examinations.
2. Students will perform hands-on experiments using the scientific method and critical thinking to solve problems.	2. Written laboratory reports and assignments.
3. Students will be able to explain how plant cells capture light energy and then transform it into chemical energy.	3. Quizzes and examinations.
4. Students will be able to describe DNA as the genetic material, with emphasis on DNA replication, cell division, protein synthesis, mutation and inheritance patterns.	4. Quizzes and examinations.
5. Students will be able to discuss the principles of science that underlie recent advances in biotechnology (cloning, genetic engineering), as well as analyze and discuss the ethical, legal and social impact.	5. Quizzes and examinations.

Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

	General Education Learning Outcomes	Measurements (means of assessment for general education goals listed in first column)
X	Scientific Reasoning- Students will be able to apply the concepts and methods of the natural sciences.	Students will assimilate class and laboratory information in order to answer questions related to biology orally and in written form.

Evaluation of Students: The course will be graded on the following:

Lecture: _____ **Lab:** _____

Final examination: _____ **Other (attendance/ participation etc.)** _____

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Required Text & Materials

Text: **Campbell Biology, 11th** Edition, packaged with MasteringBiology (required) Authors: Urry, Lisa A, et al. Publisher: Pearson, 2016 (<http://www.mypearsonstore.com/bookstore/campbell-biology-plus-masteringbiology-with-pearson-0134082311>)

Versions:

- a. Hardcover Edition: ISBN-13: 978-0-13-409341-3 Online price ~\$250
- b. Loose leaf edition (3 hole punched, complete with MasteringBiology®) for BMCC:
ISBN-13: 9780134846156 BMCC Bookstore price: ~\$191.60
- c. MasteringBiology® with Pearson eText for Campbell Biology, 11th Edition Online price ~\$116
- d. MasteringBiology® alone (students who have the text) Online price ~\$69

Lab Manual: Laboratory Manual for Biology I, **BMCC 2nd custom edition**, ISBN#978-1-5249-0801-0

The Lab Manual could also be purchased directly from the publisher through the following website:

<http://www.kendallhunt.com/jayant>

Online or Book store price: ~ \$41

My Biology 210 section is _____

It meets on _____ at _____ in room _____

Laboratory is on _____ from _____ to _____ in room N-674.

Use of Technology (if applicable)

The electronic course interface, Blackboard, Turnitin.com, and MasteringBiology may be used at the instructor's discretion.

Evaluation & Requirements of Students

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

TO PASS THIS CLASS, A STUDENT MUST HAVE A PASSING GRADE OF 60% OR MORE IN LECTURE AND A PASSING GRADE OF 60% OR MORE IN THE LABORATORY PORTION.

BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

Single Stop www.bmcc.cuny.edu/singlestop, room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, come by the Single Stop Office for advice and assistance. Assistance is also available through the Office of Student Affairs, S350, 212-220- 8130.

Counseling Center www.bmcc.cuny.edu/counseling, room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

Office of Compliance and Diversity www.bmcc.cuny.edu/aac, room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email olevy@bmcc.cuny.edu, or twade@bmcc.cuny.edu. If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

Office of Accessibility www.bmcc.cuny.edu/accessibility, room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.

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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.

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 site, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).

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Outline of Topics

Biology 210 LECTURE SYLLABUS

<u>WEEK</u>	<u>TOPIC</u>	<u>CHAPTER(S)</u>
1	<p>GENERAL THEMES IN THE STUDY OF LIFE</p> <p>Properties of living things Scientific process of inquiry and its application to society Evolution and natural selection and its role in the development of life on earth Classification: prokaryotes and eukaryotes</p> <p>BASIC CHEMISTRY</p> <p>Elements and atoms (atomic number; atomic mass; isotopes) Compounds and chemical bonds: ionic, covalent, hydrogen bonds Water, pH scale</p>	1 2 3
2	<p>BIOLOGICAL CHEMISTRY</p> <p>Carbon bonding and functional groups Macromolecules (and their building blocks): Carbohydrates (monosaccharides, disaccharides, etc.), lipids (fatty acids, glycerol, steroids, etc.), proteins (amino acids, peptides), nucleic acids (nucleotides) Proteins: structural organization; functions</p>	4 5
3	<p>CELL STRUCTURE AND FUNCTION</p> <p>Prokaryotic and eukaryotic cells: (animal and plant cells) Structure of the cell membrane, a phospholipid bilayer, proteins; Fluid Mosaic Membrane Model The nucleus is the genetic center of eukaryotic cells (nucleoli; nuclear envelope; nuclear pores) Cytoplasmic organelles enclosed by a single membrane (Golgi apparatus; smooth and rough endoplasmic reticulum; vacuoles; lysosomes; peroxisomes) Ribosomes: protein-synthesizing factories, proteosomes Double membrane bounded energy-related organelles (chloroplasts and mitochondria); Endosymbiotic Theory of the Evolution of Eukaryotic cells Cytoskeleton and related organelles (microtubules, intermediate filaments and microfilaments; cilia; microvilli; flagella) Intercellular junctions of animal cells; communication between plant cells (plasmodesmata)</p>	6
4	<p>CELLS AND THEIR MEMBRANES</p> <p>Structure and functions of biological membranes Passive and active transport across membranes and associated functions/terminology (diffusion and osmosis; hypotonic, hypertonic and isotonic solutions; involvement of membrane proteins in transport and signaling; active transport; endocytosis, exocytosis, phagocytosis), signaling (Ch. 11:210-222)</p>	7
5	<p>ENERGY AND LIFE: METABOLISM</p> <p>Energy transformation; thermodynamics Transferring energy in cells: endergonic and exergonic chemical reactions ATP, ADP and the processes of phosphorylation and dephosphorylation Enzymes as catalysts and their role in biological pathways Roles of coenzymes and electron carriers</p>	8

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6	<p>PHOTOSYNTHESIS</p> <p>Chloroplast structure (grana, thylakoid membranes, photosystems, stroma) Plant anatomy (roots, stems, leaves; Ch. 35:752-759) 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) and CO₂ fixation Generation of PGAL and production of glucose Evolution of photosynthetic pathways (C3, C4 and Crassulacean acid metabolism-CAM) Effects of deforestation and fossil fuels on global warming</p>	10
7	<p>FOOD AS A FUEL: CELLULAR RESPIRATION</p> <p>Oxidation-reduction reactions Glycolysis and fermentation (anaerobic-lactic acid and ethyl alcohol production) Breakdown of glucose to pyruvic acid Metabolic intermediates (Acetyl Coenzyme A) Citric acid cycle (decarboxylation and dehydrogenation reactions), (substrate, oxidative and photo phosphorylation) The electron transport chain (cytochromes, NADH, FADH₂) and metabolic water ATP production: proton gradient and chemiosmosis</p>	9
8, 9	<p>THE CELL CYCLE and TYPES OF CELL DIVISION</p> <p>MITOTIC DIVISION (MITOSIS) results into two identical cells Phases of the cell cycle (G₁, S, G₂, Mitosis, G₀ phase) Chromosome structure: DNA packing in prophase (Ch. 16:328-330) Mitosis (prophase, prometaphase, metaphase, anaphase, telophase) S Phase: DNA replication (Ch. 16:318-327) Comparison between plant and animal cell mitosis Cell cycle regulation, Cell cycle genes, cancer and apoptosis (Ch. 18: 383-388, Ch. 11:227-229)</p> <p>MEIOSIS: 2 special cell divisions to create sex cells (gametes) Crossing over in prophase I and random, independent assortment in metaphase I Reduction of diploid chromosome number to haploid Human spermatogenesis and oogenesis (Ch. 46:1022-1023) Comparison between meiosis and mitosis.</p>	12
10	<p>MOLECULAR GENETICS</p> <p>Evidence that DNA is the genetic molecule (Griffith, Avery et al., Hershey) Helical and antiparallel structure of DNA (Watson and Crick, Chargaff, Franklin) Semi-conservative replication of DNA (Meselson and Stahl) Mechanism of DNA replication (This subject may be covered with the cell cycle.) Gene numbers, pseudo genes</p>	16
11	<p>RNA AND PROTEIN SYNTHESIS</p> <p>Information flow: the "central dogma," DNA → RNA → protein Structure of a gene (promoter, introns, exons, intragenic DNA), non-genomic DNA, telomeric DNA Transcription: stages (initiation, elongation, termination); molecular process (roles of transcription factors and RNA polymerase); post-transcriptional processing (alternative splicing, 5' cap, 3' poly-adenylation); differences between processes in eukaryotes and prokaryotes; Cell signaling regulation (Ch. 11:223-227) Translation: stages (initiation, elongation, termination); the roles of ribosomal RNA; transfer RNA and amino acids (anticodons bond to codons in mRNA), bound vs free polysomes Basic mechanisms of the regulation of gene expression (Ch. 18:365-376);</p>	17

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ncRNAs; siRNA, miRNA, piRNA

Viruses as intracellular parasites that hijack cellular machinery (Ch. 19:392-400)

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<u>WEEK</u>	<u>TOPIC</u>	<u>CHAPTER(S)</u>
12	RECENT ADVANCES IN DNA RESEARCH AND BIOTECHNOLOGY <i>(topics covered as time permits)</i> Cloning genes; restriction enzymes; cutting, splicing and inserting DNA; Gel Electrophoresis; Application of DNA replication (Polymerase Chain Reaction-PCR); DNA finger printing (Restriction Fragment Length Polymorphisms-RFLP) Genetic therapy for treating human diseases Recombinant DNA technology (drugs, plants) What lies ahead as the human genome has been sequenced? (microarrays)	20
13, 14	MENDELIAN GENETICS 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 (co-dominance), Punnett square, epistasis, pleiotrophy) Human genes, diseases and conditions (Tay-Sachs, sickle cell disease, cystic fibrosis, Huntington's disease, albinism), Online Mendelian Inheritance in Man (OMIM) and gene maps Understanding human pedigrees Polygenic inheritance and multiple alleles	14
	CHROMOSOMES AND INHERITANCE Mutations (Ch. 23:481-482) Sex-linked genes, chromosomal mutations Linkage and crossing over in Drosophila	15

Laboratory Syllabus- specific exercises in the lab manual

<u>WEEK</u>	<u>LABORATORY FOCUS</u>	<u>MANUAL EXERCISES</u>
1	Metric system and measurements Scientific investigation	<i>Laboratory safety will be discussed.</i> Ex. 1, 2
2	Solutions, Acids and bases	Ex. 3, 4 <i>(See pH meter use in Appendix)</i>
3	Macromolecules	Ex. 5, 6 <i>(See spectrophotometer use in the Appendix)</i>
4	Introduction to the microscope; Introduction to cells	Ex. 7, 8
5	Diffusion and Osmosis	Ex. 10
6	Investigating enzymatic reactions	Ex. 11
7	Photosynthesis	Ex. 12 <i>(See spectrophotometer use in Appendix)</i>
8	Cellular respiration and fermentation	Ex. 13
9	Mitosis /meiosis	Ex. 14
10	DNA isolation	Ex. 15
11	Protein synthesis	Ex. 16
12	DNA fingerprinting	Ex. 17, 18
13	DNA transformation	Ex. 19
14	Genetics	Ex. 20
15	Finals week	