

Bergen Community College
Division of Mathematics, Science, and Technology
Department of Biology and Horticulture

General Biology I (BIO-101)

General Course Syllabus

Course Title: General Biology I (BIO-101)

Course Description: This is the first course in a two-semester sequence in general biology. The course introduces the fundamental principles of biology and their relationships to society. Lecture topics include: an introduction to science, basic chemistry, cell biology, metabolism, genetics, and a survey of the Prokaryotae, Protists, and Fungi. Laboratory exercises develop a proficiency in the use of laboratory equipment and guide students in investigations of biochemistry, cell biology and metabolism, genetics, microbiology, protists, and fungi.

Prerequisites: None

General Education Course: Yes

Course Credits: 4.0

Hours per week: 6.0: 3 hours lecture and 3 hours lab

Course Coordinator: Robert Highley

Required Lecture

Textbook: Mason, K. A., T. Duncan, G. Johnson, J. B. Losos, and S. R. Singer. **2018.** *Understanding Biology*, 2nd Ed. New York, NY: McGraw-Hill Education, Inc. (**M**)

Required Laboratory

Manual: Highley, R. **2007.** *Exercises in Laboratory Biology I*, 3rd Ed. (**ELB**)

Revised 2017 Summer

Student Learning Objectives-

Students will be able to:

1. describe the nature of science as it specifically applies to the discipline of biology. Students will use the scientific method of inquiry. They will be evaluated by lecture and laboratory examinations.
2. explain the process of evolution and the impact that Charles Darwin and other evolutionists had on the explanation of the process. Students will be evaluated by lecture examinations.
3. demonstrate the knowledge of the chemical basis of living organisms and how chemistry defines a large part of the study of biology. Students will be evaluated by lecture examinations.
4. define the characteristics of water, the medium on which all life on earth depends. Students will be evaluated by lecture examinations.
5. be familiar with the nature of organic biocompounds (carbohydrates, proteins etc...) and their importance as building blocks of living systems. Students will be evaluated by lecture examinations.
6. identify the chemical and physical structure and diversity of living organisms and how they interact with the environment. Students will be evaluated by lecture examinations.
7. list the characteristics of living organisms. Students will be evaluated by lecture examinations and student projects.
8. explain the composition and function of biological membranes. Students will be evaluated by lecture and laboratory examinations.
9. define passive transport- diffusion, osmosis, and facilitated diffusion and relate the changing conditions inside and outside of cells to these definitions. Students will be evaluated by lecture and laboratory examinations.
10. define active transport and relate the changing conditions inside and outside of cells to the need for AT. Students will be evaluated by lecture examinations.
11. explain the nature of free energy and the application of free energy to living systems, mainly in the metabolism of cells. Students will be evaluated by lecture examinations.
12. explain and describe the nature of enzymes and their critical importance to living systems. Students will be evaluated by lecture and laboratory examinations.
13. follow the cell's metabolic pathways and their energetic products in both phototrophic and chemotrophic organisms. Students will be evaluated by lecture examinations.
14. explain the need for cellular reproduction and the different types carried out by selected organisms. Students will be evaluated by lecture and laboratory examinations.
15. explain the nature of informational molecules (DNA and RNA) and the expression of this information through the process of gene expression. Students will be evaluated by lecture and lab examinations.
16. compare Mendelian and non-mendelian inheritance and describe the way living organisms pass characteristics from one generation to the next. Students will be evaluated by lecture examinations and student papers.

17. understand the importance of the light microscope to the practice of biology. Students will be evaluated in the laboratory regarding the proper use of the microscope during a laboratory practical. Students' laboratory participation may also be evaluated in the form of a student laboratory project.
18. properly use the microscope to examine the difference between selected prokaryotic and eukaryotic organisms. Students will be evaluated by laboratory observation and laboratory exams.
19. make a wet-mount of selected biological material and properly use the microscope to view the material. Students will be evaluated by laboratory observation and laboratory exams.
20. understand the importance of recording laboratory data in the form of a notebook or a laboratory report. Student notebooks or laboratory reports will be evaluated by their instructors as part of their final grade.
21. construct two different types of graphs (histogram and Cartesian), in various lab exercises, using a commercial graphing program. They review each graph for general trends that appear upon the analysis of the biological data. Students will be evaluated by lab examinations and or lab reports.
22. work as a member of a laboratory group and learn how to collect data or information as part of this group. Students will be evaluated during the laboratory period and the participation will be recorded as a component of their final grade. The evaluation may be in the form of a laboratory presentation in addition to the class participation.

Student Assessment Tools:

The above student learning objectives will be generally assessed or evaluated by instructors using a variety of **assessment instruments** including **lecture exams, laboratory exams, quizzes, laboratory reports, written reports, presentations, projects, etc.** The decisions concerning the type or types and number of instruments that are used in a specific section of the course will be left to the instructor of that section. This information, when given by the instructor should be recorded by the student in the **Student Assessment Section** of this document.

Course Content

Lecture Topics:

Chapter	Title	Text: <i>K. Mason et al. Understanding Biology (M)</i> page
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Part I The Molecular Basis of Life

1	The Science of Biology The Diversity of Life is Overwhelming Biology is the Science of Life Science is Based on Both Observation and Reason The Study of Evolution is a Good Example of Scientific Inquiry A Few Important Ideas form the Core of Biology	(M): p. 1
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- 2 The Nature of Molecules and the Properties of water **(M):**p. 21
 All Matter is Composed of Atoms
 The Elements in Living Systems Have Low Atomic Masses
 Molecules are Collections of Atoms held together by Chemical Bonds
 The Properties of Water Result from Its Polar Nature
 Water Molecules Can Dissociate into Ions
- 3 The Chemical Building Blocks of Life **(M):** p. 40
 Carbon Provides the Framework of Biological Molecules
 Carbohydrates Form both Structural and Energy-Storing Molecules
 Proteins are the Tools of the Cell
 Nucleic Acids Store and Express Genetic Information
 Hydrophobic Lipids Form Fats and Membranes
- 4 Cell Structure **(M):** p. 66
 All Living Organisms are Composed of Cells
 Prokaryotic Cells lack Interior Organization
 Eukaryotic Cells are Highly Compartmentalized
 Membranes Organize the Cell Interior Functional Compartments
 Mitochondria and Chloroplasts are Energy Processing Organelles
 An Internal Skeleton Supports the Shape of Cells
 Extracellular Structures Protect Cells
 Cell to Cell Connections Determine How Adjacent Cells Interact
- 5 Membranes **(M):** p. 94
 Membranes are Phospholipid Bilayers with Embedded Proteins
 Phospholipids Provide a Membrane's Structural Foundation
 Membrane Proteins Enable a Broad Range of Interactions with the Environment
 Passive Transport moves Molecules across Membranes by Diffusion
 Active Transport Across Membranes Requires Energy
 Bulky Materials Cross Membranes within Vesicles
- 6 Energy and Metabolism **(M):** p. 115
 Energy Flows through Living Systems
 The Laws of Thermodynamics Govern All Energy Changes
 ATP is the Energy Currency of Cells
 Enzymes Speed Chemical Reactions by Lowering Activation Energy
 Metabolism is the Sum of a Cell's Chemical Activities
- 7 How Cells Harvest Energy **(M):** p. 131
 Cells Harvest Energy from Organic Compounds by Oxidation
 Glycolysis Splits Glucose and Yields a Small Amount of ATP
 The Krebs Cycle is the Oxidative Core of Cellular Respiration
 Electrons Harvested by Oxidation Pass along an Electron Transport Chain
 The Total Energy Yield of Aerobic Respiration far Exceeds that of
 Glycolysis

15	<p>Genes and How They Work</p> <ul style="list-style-type: none"> Experiments Have Revealed the Nature of Genes The Genetic Code Relates Information in DNA and Protein Prokaryotes Exhibit all the Basic Features of Transcription Eukaryotes use Three Polymerases, and Extensively Modify Transcripts Eukaryotic Genes May Contain Noncoding Sequences The Ribosome is the Machine of Protein Synthesis The Process of Translation is Complex and Energy Expensive Mutations are Alterations in the Sequence, Number, or Position of Genes 	(M): p. 304
16	Control of Gene Expression (Overview)	(M): p. 332
17	Biotechnology (Optional)	(M): p. 358
18	Genomics (Optional)	(M): p. 383
22	<p>Systematics and Phylogeny</p> <ul style="list-style-type: none"> Systematics Reconstructs Evolutionary Relationships Cladistics Focuses on Traits Derived from a Common ancestor Classification is a Labeling Process, Not an Evolutionary Reconstruction Taxonomy attempts to Classify Organisms in an Evolutionary Context The Largest Taxa are Domains 	(M): p. 475
23	<p>Prokaryotes and Viruses</p> <ul style="list-style-type: none"> Prokaryotes are the Most Ancient Organisms Prokaryotes Have an Organized but Simple Structure The Genetics of Prokaryotes Focuses on DNA Transfer Prokaryotic Metabolism is Quite Diverse Bacteria Cause Important Human Diseases Viruses are not Organisms Bacterial Viruses Infect by DNA Injection Animal Viruses Infect by Endocytosis 	(M): p. 497
24	<p>Protists</p> <ul style="list-style-type: none"> Protists, the First Eukaryotes, Arose by Endosymbiosis Overview of Protists The General Biology and Ecology of the Protists 	(M): p. 522
25	<p>Fungi</p> <ul style="list-style-type: none"> Fungi Have Unique Reproductive and Nutritional Strategies Fungi have an Enormous Ecological Impact Fungi are Important Plant and Animal Pathogens Fungi are Taxonomically Diverse The General Biology and Ecology of the Fungi 	(M): p. 548

Laboratory Schedule:

Week Number	Title	Text: <i>Exercises in Laboratory Biology I (ELB)</i>	Page
1.	Scientific Investigation (Exercise 1)		(ELB): p. 1
	Questions		Within Exercise (WE)
2.	Scientific Measurement (2)		(ELB): p. 11
	Read: Unit Expression Factors		Appendix A, p. 193
	Read: Rules for Identifying Significant Figures		Appendix B, p. 195
	Questions		WE and p. 15
3.	Qualitative Tests for Biological Molecules (3)		(ELB): p. 19
	Carbohydrates, Proteins, Lipids, and Nucleic Acids		
	Questions		WE
	Qualitative Analysis of Two Unknown Substances (4)		(ELB): p. 33
	Questions		p. 34
4.	Light Microscopy (5)		(ELB): p. 37
	Simple Microscopes Compound		
	Light Microscopes Using A		
	Compound Microscope		
	Dissecting Microscopes		
	Questions		WE
5.	Cells (6)		(ELB): p. 51
	Prokaryotic Cells		
	Eukaryotic Cells		
	Protists, Plant Cells, and Animal Cells		
	Questions		WE
6.	Membranes		(ELB)
	Read: Biological Mixtures		Appendix C, p. 197
	Diffusion through a Simulated Semi-permeable Membrane (7)		p. 61
	Tonicity of Red Blood Cells (8)		p. 67
	Plasmolysis in Plant Cells (9)		p. 71
	The Effects of Organic Substances on Cell Membranes (10)		p. 73
	Questions		pp. 65, 69, 70, 72, and 76
7.	Enzymes (12)		(ELB): p. 83
	The Effects of Temperature		
	The Effects of pH		
	Questions		WE

8.	Energy Generating Pathways Mitochondrion and Chloroplast Structure (11) Oxygen Uptake during Aerobic Respiration (13) Fermentation (14)	(ELB) p. 79 p. 95 p. 103
	Questions	pp. 80, 98, 101, 105, and 106
9.	Photosynthesis Separation of Plant Pigments (15) A Qualitative Absorption Spectrum of Chlorophyll (16) Carbon Dioxide Incorporation during Photosynthesis (17)	(ELB) p. 107 p. 111 p. 115
	Questions	pp. 108, 112, and 117
	Mitotic Cell Division in Plants and Animals (18) The Onion Root Tip Plant Cell Division Animal Cell Division	(ELB): p. 119
	Questions	p. 123
11.	Meiotic Cell Division in a Flowering Plant (19) The Flower Meiotic Cell Division	(ELB): p. 125
	Questions	p. 129
12.	Viruses and Bacteria Viruses (20) Oil Immersion Microscopy (22) Bacterial Morphology (23) The Gram Stain (24)	(ELB) p. 131 p. 141 p. 145 p. 149
	Questions	pp. 133, 139, 142, 146, and 154
13.	The Algae (25) Introduction to the Algae Euglenophyta, Dinophyta, Rhodophyta, Bacillariophyta, Chlorophyta, and Phaeophyta	(ELB): p. 155
	Questions	WE
14.	The Protozoa (26) Introduction to the Protozoa Rhizopoda, Granuloreticulosa (Forams) Actinopoda, Kinetoplastida, Apicomplexa, Ciliophora, Myxomycota, Zoomastigota, and Archeoprotista	(ELB): p. 169
	Questions	WE

15. **The Fungi (27)** (ELB): p. 183
 Introduction to the Fungi
 Zygomycota, Ascomycota, Basidiomycota, and Deuteromycota
 The Lichens

Questions **WE**

Student Assessment:	Lecture Examinations_____	_____%
	Laboratory Component_____	_____%
	Student Project/Report _____	_____%
	Class Participation	_____%
	<u>Other</u> _____	_____%
	Total	100%

If you have a medical condition or develop a medical condition during this semester, which prevents you from fulfilling the requirements of this course, you must notify your physician. You and your physician must decide whether or not it is appropriate for you to remain in this course. If the decision is to remain in this course, please obtain a letter from your physician indicating that your continued participation in this course is appropriate and present it to the Department Chair.

Faculty Addenda: As per individual faculty member

Lecture Attendance: As per instructor;

Lab Attendance: As per instructor;

Policy Concerning Late Assignments: As per instructor;

Policy Concerning Make-Up Testing: As per instructor;

Safety Information: As per instructor and assigned exercise.

College Policies:

These policies can be found in the Bergen Community College Smart Catalog.

Student Responsibility

Students will be held responsible for reading all pertinent information in college publications regarding withdrawals, course drops, college deadlines, and tuition refunds. Students are responsible for compliance with the rules and regulations as stated in college publications.

Absence of Instructor

Students are expected to wait twenty minutes for a faculty member to come to class. If at the end of twenty minutes, the faculty member does not come, the students should sign an attendance sheet, which indicates the course, date, and time. A student should deliver the attendance sheet to the divisional office (A304) if between 9:00 a.m. and 5:00 p.m. or to the Evening Office (C107) if before 9:00 a.m. or after 5:00 p.m. Students cannot be penalized by faculty for not waiting longer than twenty minutes.

Academic Dishonesty and Plagiarism

Bergen Community College is committed to academic integrity – the honest, fair and continuing pursuit of knowledge, free from fraud or deception. Students are responsible for their own work. Faculty and academic support services staff will take appropriate measures to discourage academic dishonesty. **Plagiarism** is a form of academic dishonesty and may be a violation of U.S. Copyright laws. Plagiarism is defined as the act of taking someone else's words, opinions, or ideas and claiming them as one's own.

Consequences of Violations Academic Integrity

A. Instructor's Sanctions for a Violation

The faculty member will determine the course of action to be followed. This may include:

- Assigning a failing grade on the assignment;
- Assigning a lower final course grade;
- Failing the student in the course
- Other penalties appropriate to the violation;

In all cases, the instructor shall notify the Vice President of Student Services of the violation and the penalty imposed. The student has the right to appeal the decision of the instructor to the appropriate department head.

B. Institutional Sanctions for Violations

When a violation of academic integrity has been reported regarding a student, the Vice President of Student Services may impose disciplinary penalties beyond those imposed by the course instructor, which may include suspension or dismissal from the College. The student shall have the right to a hearing before the Vice President of Student Services or a designated judicial affairs committee. Judicial procedures governing violations of academic integrity are contained in the student handbook.

Class Attendance

All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor for each section of each course. These will be established in writing on the individual course outline. Attendance will be kept by the instructor for administrative and counseling purposes.

Eating and Drinking

Eating or drinking in classrooms, lecture rooms, laboratories, gymnasium, swimming pool, or passageways is forbidden. Covered beverages only are permitted in the library. Eating and drinking are permitted in cafeteria and vending areas only.

Learning Assistance

Henry and Edith Cerullo Learning Assistance Center

The Tutoring Center, English Language Resource Center, Math Walk-In Center and Writing Center are collectively known as the Henry and Edith Cerullo Learning Assistance Center. The Cerullo Learning Assistance Center is located in the Pitkin Education Building, in Room L-125. The telephone number is (201) 447-7489. The Learning Assistance Center, staffed with peer and professional tutors, offers free individual and group tutoring, supplemental instruction, and online tutoring for subjects offered at the College. The Center provides alternative approaches to problem solving and organizational skills. Tutors help clarify classroom lectures and textbooks and help students prepare for exams. These services build student self-confidence and reduce fear of failure. The Center is equipped with the latest technology and software, including tapes, books, review sheets, exercises and software.

Services for Students with Disabilities

The Office of Specialized Services/ Deaf Services, located in L-115 in the Pitkin Education Center provides accommodations and auxiliary services to students with disabilities attending Bergen Community College. Students are encouraged to submit documentation to OSS during the early stages of the admission process. The suggested deadlines for submitting documentation are as follows: August 1st for fall semesters, December 1st for spring semesters. For more information please contact our office at 201-612-5270 or at www.bergen.edu/oss.

Sidney Silverman Library

Main Building, Pitkin Education Center, L-wing, 2nd Floor.

Paramus Library Hours: (201) 447-7131 or visit <http://www.bergen.edu/library/calendar/gcal.htm>

Paramus Service Desk: (201) 447-7970

Meadowlands Location: 1280 Wall Street, Lyndhurst 2nd Floor

Meadowlands Library Hours: <http://www.bergen.edu/library/calendar/gcal.htm>

Meadowlands Service Desk: (201) 301-9692

www.bergen.edu/library

Testing Services

The Bergen Community College Office of Testing Services (OTS) is located in Room S-127. OTS serves the college community by identifying, developing, procuring, administering, processing, and/or evaluating examinations, which meet a variety of administrative and instructional needs. To contact the OTS, please call (201) 447-7203. The Office of Testing Services administers makeup tests as a service for students who, for compelling and exceptional reasons, have missed a scheduled classroom examination. Students must receive prior permission from and make arrangements with their course instructors to take these examinations, under specific conditions, in the Office of Testing Services, Room S-127.

WebAdvisor

WebAdvisor is a web interface that allows students to access information contained in Datatel's Colleague, the administrative database used by Bergen Community College. Students may use WebAdvisor to register for classes, to pay tuition and fees, to view their class schedules, to check grades, to check on progress toward degree requirements, etc. WebAdvisor accounts are available for all students enrolled in credit programs. New students are strongly encouraged to attend an in-person registration or advisement session before using a WebAdvisor account. Eligible students without WebAdvisor user names and passwords may access their WebAdvisor account by going to go.bergen.edu and selecting "I'm new to WebAdvisor." Then, follow the on-screen directions. Check the WebAdvisor FAQ for answers to common questions, such as how to reset your password. Students must have a valid e-mail address on file with the College to use WebAdvisor 5/25