Intro Bio 1 - Fall 2023

BIOL UN2005/2401
TR 10:10-11:25 (417 IAB)
4:10 - 5:25 (417 IAB)

Marko Jovanovic
Michelle Attner

Course Description and Objectives

Course Description and Objectives:
Intro Bio I is an introductory course for science majors and premedical students who have completed a year of college chemistry. **This is a problem-based course** that covers the following broad topics: biochemistry, molecular biology, and genetics.

Learning goals:
At the end of this course, students should be able:

- To solve problems that apply concepts to new situations.
- To appreciate the process of scientific inquiry, including forming and testing hypotheses, analyzing data, and building models.
- To explain the evidence for evolution at the molecular level.
- To explore how scientists use methods in biology to make new discoveries.

Learning objectives:
At the end of this course, students should be able:

- To describe the structure and properties of biological macromolecules such as polysaccharides, lipids, proteins, and nucleic acids.
- To analyze the function of biological macromolecules and explain the relationship between structure and function.
- To diagram enzyme catalysis and apply the Michaelis-Menten equations for enzyme kinetics.
- To understand the overarching concepts of metabolic pathways, including energetics and regeneration of scarce components, using glycolysis and Krebs' cycle as examples.
- To compare and contrast how biological macromolecules are synthesized.
- To explain how synthesis of macromolecules is regulated.
- To describe information flow from DNA→ RNA → protein, and to predict the outcome if there are mistakes.
- To apply concepts from transcription to gene regulation in prokaryotes.
- To explain how the molecular biology of bacteria is harnessed by scientists for biomedical research.
- To devise a strategy to clone a gene using recombinant DNA technology.
- To explain how meiosis reshuffles genetic material.
- To determine the mode of inheritance of a trait.
- To determine whether two genes are linked or unlinked.
- To apply Hardy-Weinberg equilibrium and explain mechanisms of evolution.

Students will achieve these objectives through rigorous problem-solving.

Instructor Information

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M 10:30AM-12pm – Fairchild 900
Evening Zoom hour: Thurs 10-11PM

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Office hours (for Lectures 10-23):
M 10:30AM-12PM – Fairchild 900
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Course director: Michelle Attner
Course administrator: Liliana Rosario
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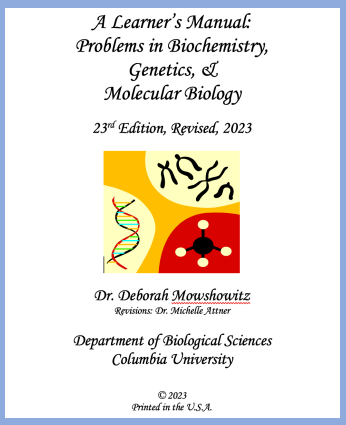
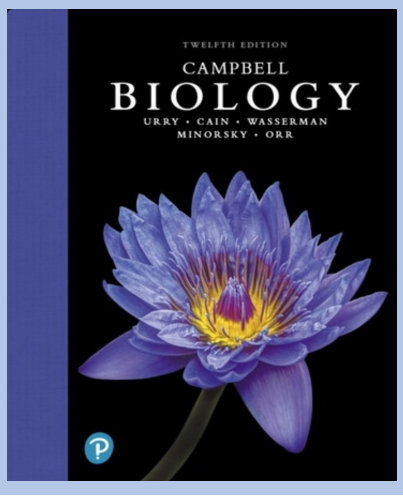
Inside the Syllabus

Required Textbook: Learner's Manual



The Learner's Manual will be available as a PDF on the Courseworks/Canvas site. A paper copy of the Learner's Manual can be purchased from the Village Copier, 118th and Amsterdam Ave., usually from the first day of class.

Recommended Textbook



Grading Scale 2005

If your total points are ≥	You are guaranteed
336	A
321	A-
306	B+
291	B
276	B-
260	C+
243	C
225	C-

2401

If your total points are ≥	You are guaranteed
276	A
261	A-
246	B+
231	B
216	B-
200	C+
183	C
165	C-

Note: Exams for 2005 and 2401 are the same. The grading scales are different because of the 60 recitation quiz points for UN2015 recitations.

Exams

Exams will be given in the afternoon class time slot. If you are in the morning class, you must take the exams at 4:10 if possible or as soon as possible after that on Thursday evenings.

There will be three non-cumulative midterms and a final, each worth 100 points. One midterm will be dropped (or if your final is your lowest score 50% of your final and 50% of your lowest midterm will be dropped instead). There will be no make-up exams without a very good reason and supporting documentation. If you are ill on the day of a midterm, we expect you to drop that midterm. Please note all exam dates and arrange your travel plans accordingly.

CourseWorks2/Canvas

Since a lot of course materials (including audios and/or videos of class sessions), keys to recitation problems, practice exams, etc. will be posted on the course Canvas site throughout the semester, it is necessary to consult this site at least weekly. All the materials needed for a particular lecture will be posted in a folder for that lecture (in Files > Lecture Materials). This includes lecture slides (as powerpoint and pdf files), handouts, and audio files. Practice exams and exam keys will be posted in "Files" in the "Exams" folder.

Accommodations

In order to receive disability-related academic accommodations for this course, students must first be registered with their school Disability Services (DS) office. Detailed information is available online for both the Columbia and Barnard registration processes. Refer to the appropriate website for information regarding deadlines and disability documentation requirements.

Course Policies

Make-up exams. Make-up exams will be administered at the discretion of Dr. Attner, and must be discussed before the exam. If you are ill on the day of a midterm exam, we expect that you will drop that exam. We know illness can arise, and this is a major reason why we allow you to drop an exam.

Regrade Policy. Regrade submission is allowed up to one week after return of exams. A more detailed regrade procedure will be posted on the course Canvas site.

Lecture recordings. We are planning to provide Zoom recordings of the lecture. However, we reserve the right to switch to an audio recording for any pedagogical reason.

Honor Code/Academic Integrity. Your full observance of the Columbia College Honor Code is expected.

Recitations

A very important component of this course is recitations, where you will have the opportunity to solve problems in small groups, under the guidance of a TA who excelled in this course and was selected for an ability to facilitate problem solving. UN2005 students must register for a recitation (UN2015). There are optional recitations for UN2401 students – it is not necessary to sign up for these. The times and locations of recitations are listed on the Canvas page, in the left menu link: Recitations and TAs.

The Learners' Manual

Because we expect you to master such a difficult task during exams – applying biological concepts to new situations – we give you plenty of practice beforehand. The Learners' Manual is designed to both help you learn the material and gain practice in complex problem solving. Similarly, recitation problems give additional practice in exam style problem solving. There are a lot of practice problems. Do not leave them until the last minute.

Exam Wrappers

You will have the opportunity to earn bonus points after exams 1 and 2 by reflecting on how to improve your study habits based on where you lost points on the exams. Exam wrappers will be in Assignments and will be due about a week after the key and your copy of the exam are available for comparison. Exam wrappers will be required of students seeking instructor advice on how to improve exam performance.

Help & Resources

1. Participate

The course has been specifically designed to include elements of group learning for two reasons: studies show that peer discussion improves student learning and employers greatly value an ability of employees to work in teams. Participation in these activities will benefit you and your classmates.

2. Ask questions

Don't be shy to ask questions in class, in recitation or at office hours. Most likely, many of your classmates will benefit from the additional clarification given because of your question.

3. Office Hours

Instructors hold weekly office hours (see page 1) and TAs hold office hours before each exam. Participation is not required, but is highly recommended. A schedule of TA office hours will be published on the Exam page for each exam.

4. Advice Pages

Advice from former students and TAs has been collected and made into an advice page. This is a good first option on getting advice on how to excel in the course, how to approach problem solving, how to explain answers on exams, etc.

5. EdDiscussion

EdDiscussion, which you can link to from Canvas, is an app which allows students to ask and answer each others' questions. The TAs will monitor student answers for correctness and modify as necessary.

Course Schedule

Date	Lecture	Topic
September 5	Lecture 1	Intro, Exponential growth, water, start functional groups
September 7	Lecture 2	Functional groups, acids/bases, lipids (Recording)
September 12	Lecture 3	Sugars, polysaccharides, start amino acids
September 14	Lecture 4	Amino acids, protein structure, peptide bonds
September 19	Lecture 5	Protein structure, small mol. separation methods, 2° structure
September 21	Lecture 6	3D structure, quaternary structure, protein purification methods
September 26	Lecture 7	Catalysis, chemical kinetics, enzyme kinetics, enzyme inhibition
September 28	Exam 1	Lectures 1-6
October 3	Lecture 8	Free energy of chemical reactions, ATP hydrolysis, glycolysis
October 5	Lecture 9	Krebs cycle, electron transport, oxidative phosph., ATP synthase
October 10	Lecture 10	DNA as hereditary material, nucleic acid structure
October 12	Lecture 11	DNA synthesis
October 17	Lecture 12	Finish DNA synthesis, PCR, central dogma
October 19	Exam 2	Lecture 7-11
October 24	Lecture 13	Transcription, start translation
October 26	Lecture 14	Finish translation, mutation
October 31	Lecture 15	Viruses; bacterial gene regulation (operons)
November 2	Lecture 16	Bacterial genetics
November 7	HOLIDAY	
November 9	Lecture 17	Recombinant DNA technology I
November 14	Lecture 18	Recombinant DNA technology II
November 16	Exam 3	Lectures 12-17
November 21	Lecture 19	Eukaryotic cell division: cell cycle, mitosis, meiosis
November 23	HOLIDAY	
November 28	Lecture 20	Eukaryotic genetics: one gene at a time; sex linkage; dominance
November 30	Lecture 21	Eukaryotic genetics: dominance; indep. assortment, linkage
December 5	Lecture 22	Wrap up of genetics; population genetics
December 7	Lecture 23	Evolution
December 19	Final exam	Lectures 18-23

Lectures 1-9: Dr. Marko Jovanovic; Lectures 10-23: Dr. Michelle Attner