Intro Bio II - Spring 2023

BIOL UN2006/2402
TR 10:10-11:25 (417 IAB) &
4:10 - 5:25 (309 Havemeyer)

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Mary Ann Price

Course Description, Goals and Objectives

Intro Bio II is an introductory course for science majors and premedical students who have completed a year of college chemistry and Intro Bio I. This is a problem-based course that covers the following broad topics: cell biology, physiology, development, and neurobiology.

Learning goals:

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

- To appreciate the process of scientific inquiry, including forming and testing hypotheses, analyzing data, and building models.
- To solve problems that apply concepts to new situations.
- To explain the differences between prokaryotic and eukaryotic organisms and the consequences of membrane-bound organelles and multicellularity.
- 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 of eukaryotic cells, including the endomembrane system, cytoskeleton, and cell-cell junctions, and to understand the implications of these features for cell and organismal function.
- To describe, quantitatively, the transport of small molecules across membranes.
- To diagram the steps of receptor-mediated endocytosis and to describe the possible fates of endocytosed molecules.
- To describe the synthesis and sorting of integral membrane proteins.
- To describe chromatin structure and its implications for replication and transcription.
- To explain transcription in eukaryotes, including mRNA processing and the regulation of transcription.
- To understand post-transcriptional and post-translational regulation.
- To understand cell-cell signaling and its role in cell and organismal function, including modes of signaling and the mechanisms of intracellular pathways, with a focus on G-protein coupled receptors.
- To apply the concepts of signaling to the role of hormones in homeostasis.
- To apply the concepts of transport and signaling to the functions of the kidney in water and salt balance.
- To understand how the movement of ions across membranes leads to electrical signaling and the functions of neurons.
- To apply the concepts of transcriptional regulation and signaling to tissue and organ development.
- To describe clonal expansion of B cells (and its parallels with evolution).
- To describe the roles of T cells in adaptive immunity.
- To apply concepts in immunology to vaccination.
- To describe cell cycle regulation and its role in cancer.

Instructor Information

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Lectures 11-23

Office hours: W 12:30-2, 800 Fairchild
W 6:30-7:30pm (Zoom)

Course assistant: Liliana Rosario (introbio@columbia.edu)

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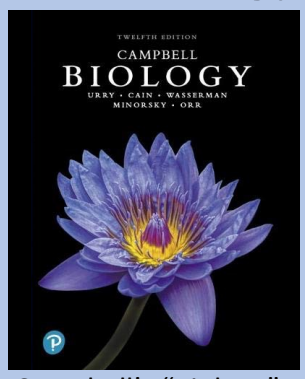
Required Textbook: Learner's Manual

This semester the Learner's Manual will be provided as PDFs for each chapter.

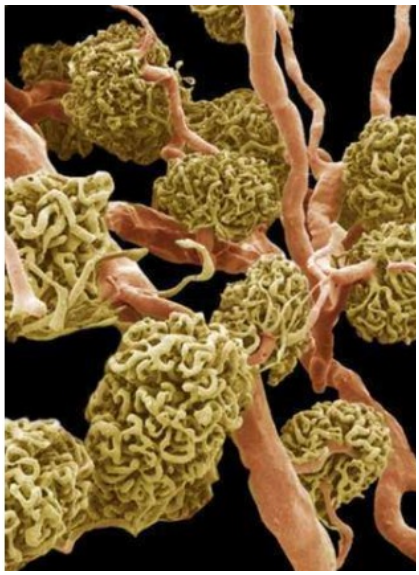
Additional reading:

We will provide pages of Becker "World of the Cell" (9e, Pearson), as necessary.

Recommended Textbook: Campbell's Biology



Campbell's "Biology", 12th edition, Pearson.



Grading Scale 2006

If your total points are ≥	You are guaranteed
371	A
356	A-
341	B+
326	B
311	B-
296	C+
281	C
266	C-

2402

If your total points are ≥	You are guaranteed
271	A
256	A-
241	B+
226	B
211	B-
196	C+
181	C
166	C-

Note: Exams for 2006 and 2402 are the same. The grading scales are different because of the 100 recitation quiz points for UN2016 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. 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 excuse. Please note all exam dates and arrange your travel plans accordingly.

CourseWorks2/Canvas

Since a lot of course materials, 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 (left menu) > Lecture Materials). This includes lecture slides and handouts. Recordings of lectures will be in Course Video Recordings (left menu), though we reserve the right to discontinue Zoom recordings if attendance is low. In that case, we will provide an audio recording instead.

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 the instructor. Should an emergency arise, please contact Liliana (introbio@columbia.edu) as soon as possible to arrange a make-up, before the exam unless it is impossible. In case of serious illness or personal crisis (including COVID-related illness and/or quarantining), rescheduling of the exam will require either supporting evidence (doctor's note, hospital admission documents, etc.) or an e-mail from your general advisor supporting your absence.

Regrade Policy. Regrade submission is allowed up to one week after return of exams. A more detailed regrade procedure is posted on the course Canvas site (in the left menu).

Honor Code/Academic Integrity. Your full observance of the Faculty Statement on Integrity and Columbia College Honor Code is expected. Both can be found here.

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 in problem solving. UN2006 students must register for a recitation (UN2016). There are optional recitations for UN2402 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 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. We advise keeping up as we go.

Extra Credit – SURF Symposium

The SURF Symposium is a showcase of undergraduate research at Columbia. About 60 Columbia students undertook novel scientific research in a lab last summer and they will present their results in a poster. The SURF Symposium is March 3, 11:30am-1pm, in Low Rotunda. You will have the opportunity to earn up to 4 bonus points by attending the SURF Symposium and writing a report on 1-2 posters (see Canvas site for details).

Help & Resources

1. Attend class and participate

Come to class. Engage in discussion of Poll Everywhere questions. Actively, participate in recitation. If you find the class material difficult to follow, read the text or watch last year's Zoom video to prepare for the lecture.

2. Ask questions

Don't be shy to ask questions in class, in recitation and/or at office hours. There are no stupid questions, and most likely some of your classmates will benefit from the additional clarification.

3. Office Hours

Instructors hold weekly office hours (see page 1 for details) 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 several advice pages. 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
January 17	Lecture 1	Overview of the Cell & Methods of Cell Biology
January 19	Lecture 2	Cytoskeleton
January 24	Lecture 3	Membrane structure; membrane proteins; cell-cell junctions; ECM
January 26	Lecture 4	Cell & tissue types; transport of small molecules across membranes
January 31	Lecture 5	Transport of small molecules, cont.
February 2	Lecture 6	Moving large molecules into/out of the cell; RME
February 7	Lecture 7	Synthesis of membrane proteins
February 9	Exam 1	Lectures 1-6
February 14	Lecture 8	Sorting of membrane proteins to lysosome, nucleus, etc.
February 16	Lecture 9	Chromatin structure; regulation of eukaryotic gene transcription
February 21	Lecture 10	Regulation of eukaryotic transcription, cont.
February 23	Lecture 11	Post-transcriptional regulation
February 28	Lecture 12	Chemical signaling I: types of signals and receptors
March 2	Exam 2	Lectures 7-11
March 7	Lecture 13	Chemical signaling II: intracellular receptors and GPCRs
March 9	Lecture 14	Use of signaling in homeostasis; control of blood glucose
March 13-17	HOLIDAY	Spring Break
March 21	Lecture 15	Hormones
March 23	Lecture 16	Thyroid; kidney function – salt and water homeostasis
March 28	Lecture 17	Kidney, cont.; Intro to electrical communication
March 30	Lecture 18	Electrical communication II
April 4	Lecture 19	IP3 signaling
April 6	Exam 3	Lectures 12-18
April 11	Lecture 20	Organization of the nervous system; skeletal and smooth muscle
April 13	Lecture 21	Muscle, cont.; Immunology
April 18	Lecture 22	Viruses
April 20	Lecture 23	Cancer & cell cycle regulation
April 25	Lecture 24	Animal development and stem cells
April 27	Lecture 25	Stem cells, cont.; sex determination
May 9	Final exam	lectures 19-25

Lectures 1-8: Dr. Jellert Gaublomme; Lectures 9, 10, 24, 25: Dr. Alice Heicklen; Lectures 11-23: Dr. Mary Ann Price