

BIOL 12: Cell Structure and Function

Fall 2020

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COURSE GOALS & LEARNING OBJECTIVES

- 1. Become conversant in Cell Biology.** This will involve learning vocabulary relating to this field of study and using this vocabulary correctly. Developing a complete vocabulary is necessary to discuss cellular processes accurately. Moreover, having information readily available in one's mind is required in order to quickly make mental connections that lead to new insights and facilitate problem solving.
- 2. Understand the experimental methods used to study cells.** We will discuss a broad range of techniques including different types of microscopy, biochemical and molecular analyses, and genetic approaches, all of which are routinely used by scientists to dissect how cells function. You will need to develop a thorough understanding of the underlying theory as well as the technical application of these techniques. A solid background in this area will allow you to apply this information to a diverse set of circumstances, including interpretation of experimental data and the ability to propose new experiments to answer specific questions.
- 3. Gain a working knowledge of cellular organization and function.** Our work in this course will allow you to gain a mastery of membrane structure and function and how cellular compartments are formed, how cells generate and utilize energy, how proteins are trafficked to the correct location and/or organelle within the cells, how cells respond to their environment, how signaling pathways within the cell elicit specific cellular responses, how cytoskeletal components are assembled and how they regulate cell shape and motility, how the cell duplicates and divides, how cells are organized into tissues, and how disruption of many of the above cellular processes can lead to cancer.
- 4. Develop the analytical skills of a Cell Biologist.** In this course, we will be asking you to think like scientists, whether it be critical analysis of data or the execution and/or interpretation of a scientific experiment. Further, you will gain experience approaching cell biology as a problem-solving endeavor, in which you interpret microscopic images and/or utilize your knowledge of the mechanistic details of cellular processes. Class meetings and exam questions will give you the opportunity to take what you have learned about a normal cellular process and predict a logical outcome when specific parameters are altered (i.e. by experimental manipulation, genetic mutation, drug treatment, etc.).
- 5. Discover the inner beauty of the cell.** Cells are incredibly complex and innately beautiful. Throughout the term you will frequently be viewing amazing images (and movies!) generated by diverse microscopy techniques. Even without a molecular understanding of how cells work, one can appreciate their beauty. Learning about their structure and function adds an extra dimension to this beauty.

CLASS SCHEDULE

Zoom links are provided on Canvas
 Synchronous class meetings via Zoom on Mondays and Fridays
 Office Hours via Zoom during class time on Wednesdays
Section C: 10:20 – 11:25 am (= Section 02, Bickel)
Section F: 2:35 – 3:40 pm (= Section 01, Grotz)
 Exams: 2.5 hour block within a specified 28 hour window

Date	Topic	Karp Chapters (not required)
Module 1		
How do we view cells?		
9/14 M	Course Logistics & Intro to Cell Architecture	Ch. 1
9/18 F	Microscopy	Ch. 18
How do we analyze cells?		
9/21 M	Protein Structure & Function / Experimental Approaches	Ch. 2, 18
How are cell compartments built?		
9/25 F	Thermodynamics & Enzymes	Ch. 3
9/28 M	Membrane Structure & Composition	Ch. 4
10/2 F	Transport Across Membranes	Ch. 4
10/5 M	Pre-Exam Q & A	
10/6-7 T,W	Exam 1 (Microscopy through Transport Across Membranes)	
Module 2		
How do cells generate and utilize energy?		
10/9 F	Energy	Ch. 3, 5, 6
How do proteins know where to go in the cell?		
10/12 M	Protein Sorting: Nuclear	Ch. 12.2
10/16 F	Protein Sorting: Secretory Pathway	Ch. 8
10/19 M	Protein Sorting: Secretory Pathway	Ch. 8
How do cells receive, integrate and process information?		
10/23 F	Cell Signaling	Ch. 15
10/26 M	Pre-Exam Q & A	
10/27-28 T,W	Exam 2 (Energy through Cell Signaling)	
Module 3		
How do cells regulate cell shape and motility?		
10/30 F	Cytoskeleton-Intro & Actin	Ch. 9
11/2 M	Cytoskeleton-Microtubules	Ch. 9
11/6 F	Cytoskeleton-Intermediate Filaments and Connections between Cells	Ch. 7, 9
11/9 M	Cytoskeleton during Mitosis	Ch. 14
How do cells duplicate?		
11/13 F	Cell Cycle	Ch. 14
What happens when cell biology “fails”?		
11/16 M	Cancer	Ch. 16
TBD	Pre-Exam Q & A	
TBD	Exam 3 (Cytoskeleton through Cancer)	

EXPECTATIONS

Here's what we expect from you:

- 1) To listen to and engage with lecture materials BEFORE class meetings
- 2) To attend class mentally prepared to think about Cell Biology
- 3) To be willing to ask questions and participate in class discussions and exercises
- 4) To utilize active learning techniques to master course material
- 5) To arrive to remote laboratory sessions on time and prepared
- 6) To complete assignments on time

Here's what you can expect from us:

- 1) To bring expertise and enthusiasm to the class
- 2) To be willing to answer questions and facilitate discussion
- 3) To challenge you to stretch beyond your comfort zone
- 4) To encourage you to try new approaches for studying and learning that are "active"
- 5) To provide opportunities for you to practice problem solving
- 6) To foster an inclusive learning environment

TEXTBOOK (not required)

On the schedule, we are providing information about relevant chapters in the 8th edition of **Cell and Molecular Biology: Concepts and Experiments**, by Gerald Karp. However, we are not requiring that you purchase and/or read the textbook. Exams will cover material that is presented in lecture materials, in class meetings, and in the classroom exercises. The textbook can be used as a reference to help clarify your understanding of this material. Some students find this very helpful, while other students don't use the textbook at all. In deciding whether or not to purchase the textbook, consider what study strategies are most productive for you.

METHODS OF ASSESSMENT AND GRADES

20%	Exam 1
21%	Exam 2
22%	Exam 3
20%	Lab Grade
10%	Vocabulary Quizzes
4%	Reflections (Canvas Surveys) on lecture materials
3%	Class Meeting Attendance

Exams will evaluate your understanding of the materials presented in the lecture recordings and in-class exercises and will test your ability to apply this knowledge to solve problems. Exams will be available during a 28-hour window via Gradescope. Once you download the exam, you will have 2.5 hours to complete it and submit your answers. Exams will be open resource, but must be completed independently (no collaboration, discussion, or exchange of information with others).

Lab will utilize a combination of assessment methods (i.e. pre-lab quizzes, small group in-class exercises, and independent lab assignments) to evaluate your understanding of laboratory methods, experiments, and data analysis.

Vocabulary Quizzes are designed to help you develop the language skills necessary to accurately discuss experiments and cellular processes. We will be posting a list of important vocabulary terms for each topic we cover. We encourage you to use the lecture materials to make sure you understand these terms/phrases and can use them appropriately. Many students find flashcards a useful strategy. The online resource "Quizlet" <https://quizlet.com/> allows you to easily generate electronic flash cards.

To promote a more structured learning environment within the context of remote instruction, we will administer weekly Canvas vocabulary quizzes that will allow you to assess your mastery. Quizzes will be open for 28 hours and due on Saturday at 11:59 PM EDT. Our goal is to help you pace your learning process and provide you with a method to identify gaps in your understanding before the exams. Your 8 highest quiz scores (out of 9 total) will be used to calculate the Vocabulary portion of your final grade.

Reflections (administered as Canvas Surveys) will be due at 11:59 PM EDT the night before each synchronous, remote class meeting. Lecture materials will be available a few days before each class meeting. Students are expected to listen to pre-recorded lectures and engage with lecture materials BEFORE class meetings. In each survey, you will be asked to reflect on the most important concepts and take-home messages from the lecture material. Reflections are also an opportunity to ask questions or identify points of confusion. There will be a total of 16 Reflection Surveys, and 4% of your final grade will be calculated using the tiered system shown on the right.

# of Reflections Submitted	% of final grade awarded
13-16	Full credit (4%)
11-12	3%
9-10	2%
8	1%
7 or less	0%

Remote class meetings will be used primarily for small-group learning activities and clarification of lecture material. Students are expected to attend and participate in all class meetings. However, we recognize that attending synchronous class meetings may present a greater challenge for some students. Therefore, **Attendance at Class Meetings** will be tabulated separately for each of the three course modules (see class schedule). Each module will be worth 1% of your final grade. For each module, you will need to attend at least three class meetings (not including pre-exam Q & A sessions) to attain credit. The first day of class (9/14/20) will not count toward attendance.

GRADING POLICIES

After graded exams and scores are released, a copy of the answer key will be posted on Canvas. Review this answer key carefully and be sure you understand the errors you made and why the posted answers on the key are correct. As we move through the term, we will be building upon material and techniques that we have discussed previously, so it is imperative that you address gaps in your understanding.

We take great care to grade exams carefully and consistently. However, if you think an error was made in grading, you may submit an error correction request within one week of receiving your graded exam via Gradescope. In an email to Dr. Warren, indicate the number(s) of the question(s) to be re-evaluated. The error correction process will take a few days. Requests made after the one-week deadline will not be considered.

A final word about grades and exams: You are not competing against each other for grades in BIOL 12. We want to be very clear and reiterate this point: You are not competing for grades in this class with anyone but yourself. All grades, up until the final letter grades are decided, are recorded as numerical scores. We do NOT assign letter grades to individual exams. Here are three important points about grades in BIOL 12:

[i] **A grade of 90% or above will always be at least an A minus.** No one is ever penalized for learning what we teach them. Thus, it is entirely possible for everyone in the class to receive a grade of A minus or better. However, our experience suggests that this will not happen.

[ii] **In order to receive a D or higher, you have to achieve a final grade of at least 50%.** In other words, a final grade less than 50% is an E.

[iii] **The median grade of BIOL 12 will mostly likely be a B.** That means if the median numerical score for the course were 62%, then a grade of 62% is a B. If the median were 29%, then a grade of 29% is a B (hence negating rule [ii] above). If the median numerical score is 94% then the median letter grade for the course will be an A or A- (see rule [i] above).

FACILITATING YOUR LEARNING PROCESS

Several lines of evidence indicate that certain activities promote learning and retention MUCH better than re-reading your notes. If you would like to learn more about the most effective strategies for studying and learning (and the research underlying these recommendations), we highly recommend the book “**Making it Stick: The Science of Successful Learning**” by Brown, Roediger III, and McDaniel. Miranda Greig, the Science Teaching Fellow, has read this book and is happy to talk about its contents and how to use these strategies in Bio 12.

Please see the Canvas site for additional tips about how to succeed in BIOL 12.

ADDITIONAL COURSE POLICIES

A Note About Technology

Class meetings will be held on Zoom (dartmouth.zoom.us), and assignments will be submitted electronically. We will try to anticipate and accommodate any technology constraints; if you are experiencing technology barriers that are affecting your ability to participate and complete the coursework, please contact the professor teaching your section as soon as possible.

Consent to Record

All class meetings will be recorded

(1) Consent to recording of course and group office hours

- a) I affirm my understanding that this course and any associated group meetings involving students and the instructor, including but not limited to scheduled and ad hoc office hours and other consultations, may be recorded within any digital platform used to offer remote instruction for this course;*
- b) I further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and distribution of any of these recordings in whole or in part without prior written consent of the instructor may be subject to discipline by Dartmouth up to and including expulsion;*
- c) I authorize Dartmouth and anyone acting on behalf of Dartmouth to record my participation and appearance in any medium, and to use my name, likeness, and voice in connection with such recording; and*
- d) I authorize Dartmouth and anyone acting on behalf of Dartmouth to use, reproduce, or distribute such recording without restrictions or limitation for any educational purpose deemed appropriate by Dartmouth and anyone acting on behalf of Dartmouth.*

(2) Requirement of consent to one-on-one recordings

By enrolling in this course, I hereby affirm that I will not under any circumstance make a recording in any medium of any one-on-one meeting with the instructor without obtaining the prior written consent of all those participating, and I understand that if I violate this prohibition, I will be subject to discipline by Dartmouth up to and including expulsion, as well as any other civil or criminal penalties under applicable law.

Student Accessibility Needs

Students requesting disability-related accommodations and services for this course are encouraged to schedule a phone/video meeting with the professor teaching your section as early in the term as possible. This conversation will help to establish what supports are built into this online course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (student.accessibility.services@dartmouth.edu; <https://students.dartmouth.edu/student-accessibility/>; 603-646-9900). SAS will notify us regarding individual student accommodations. We will then work together with SAS if accommodations need to be modified based on the online learning environment. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please contact the professor teaching your section before the end of the second week of the term to discuss appropriate accommodations.

A Note About Health

The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including your undergraduate dean (<https://students.dartmouth.edu/undergraduate-deans/>), Counseling and Human Development (<https://students.dartmouth.edu/health-service/counseling/about>), and the Student Wellness Center (<https://students.dartmouth.edu/wellness-center/>). We encourage you to use these resources to take care of yourself throughout the term, and to come speak to us if you experience any difficulties.

Please note that if you are directly or indirectly affected by COVID-19 in a way that affects your ability to participate in the course, please contact the professor teaching your section as soon as possible so that we can work together to make sure you are aware of resources for assistance and so that we can implement any appropriate accommodations. If you are more comfortable, you can also reach out to your Dean.

Financial Difficulty

If you encounter financial challenges related to this class, please let your professor know.

Sexual Misconduct and Title IX

At Dartmouth, we value integrity, responsibility, and respect for the rights and interests of others, all central to our Principles of Community. We are dedicated to establishing and maintaining a safe and inclusive campus where all have equal access to the educational and employment opportunities Dartmouth offers. We strive to promote an environment of sexual respect, safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community.

The Sexual Respect Website (<https://sexual-respect.dartmouth.edu>) at Dartmouth provides a wealth of information on your rights with regard to sexual respect and resources that are available to all in our community.

Please note that faculty members are obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator. Confidential resources are also available, and include licensed medical or counseling professionals (e.g., a licensed psychologist), staff members of organizations recognized as rape crisis centers under state law (such as WISE), and ordained clergy (see https://dartgo.org/titleix_resources).

Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator or the Deputy Title IX Coordinator for the Guarini School. Their contact information can be found on the sexual respect website at: <https://sexual-respect.dartmouth.edu>.

ACADEMIC HONOR

The Dartmouth College Student Handbook states "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth."

There are a number of situations in which a student in BIOL 12 might find themselves tempted to violate the Academic Honor Principle. These situations include (but are not limited to) the following:

- a) Exams will be open resource but must be completed independently (no collaboration, discussion, or exchange of information with others). The answers that you provide must be entirely your own work.
- b) Science is a collaborative field, and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. During lab meetings, you will work with one or more partners to complete an in-class assignment. This assignment will be graded as a group submission. However, the lab summary assignments are to be prepared **independently**. Any lab summary submitted for grading must represent the **original work** (words, graphs, tables etc.) of the student submitting the assignment. Do not share computer files of work (including text, graphs, tables, etc.) to be submitted for grading! Failure to write the lab summaries independently will be considered a violation of the Dartmouth Honor Principle.
- c) Exams and quizzes will be available over a 28-hour period. The sharing of any content of exams or quizzes is a violation of the Honor Principle.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the faculty will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that **College faculty are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards.**