

## BC368: Biochemistry of the Cell II Spring 2022

*Important note: any of the below information could change at any time due to COVID-19.*

**Instructor:** Julie Millard, Dorros Professor of Life Sciences  
Keyes 304, 859-5757; [jtmillar@colby.edu](mailto:jtmillar@colby.edu)

**Office hours:** Mon, 3:00-4:00; Wed, 4:00-5:00; Thur, 11:00-12:00; Mon and Wed are via Zoom (Meeting ID 311 745 010); Thur will be in person- please catch me after class to discuss where we will meet. (My office has no ventilation, so it won't be there.) Office hours may move outdoors when it warms up. Email is also a quick way to get a question answered, although I probably won't answer after about 7 PM until the next day.

**Text:** Nelson and Cox, Lehninger's Principles of Biochemistry; 7th Edition  
(any edition is fine, although the page numbers won't line up)

**Course Webpage:** <http://web.colby.edu/bc368/>

**Course Overview and Goals:** This course is a continuation of BC 367. That course concentrated on protein structure, enzyme kinetics and mechanisms, and the structure and function of lipids, carbohydrates, and nucleic acids. This course focuses on the deployment and use of these biomolecules throughout the cell. Chemical signaling, membrane phenomena, metabolism, bioenergetics, and regulatory processes will be of particular interest. We will examine individual reactions and metabolic pathways while investigating how cells and organisms integrate and regulate these reactions and pathways to accomplish specific tasks. While we will focus on human examples, plants, microbes, and other animals will also be considered. Topics include the generation and use of metabolic energy, the integrated control of cellular functions, and mechanisms of transport. Learning goals include the development of problem-solving, critical-thinking, and communication skills in both the lecture and laboratory, as well as data interpretation and contextualization to real-world problems. Biochemistry is both logical and complex, and its extensively interconnected nature provides a platform for learning how to think both broadly and deeply about various topics, how to see connections between concepts, and how to ask the most important questions.

**Expectations:** Here are the things that I expect from you in this course:

1. That you keep up-to-date with all of the reading assignments, complete all assignments on time, and come to lecture, discussion, and lab sessions prepared to participate and ready to learn.
2. That you bring your energy and enthusiasm about science to class, and that you participate and engage positively in the topics and discussions that we formulate as a group. You should strive for excellence in identifying important questions and in communicating your questions, comments, and responses as clearly as possible.
3. That you show resilience and the ability to think on your feet when your answers are challenged; no one is correct 100% of the time and changing your mind gracefully when presented with new facts or competing ideas is a useful skill to possess in any field.

**Lecture Topics:** Lectures in this course are rich in content. The anticipated schedule of lecture topics, along with the corresponding textbook readings, is shown below. We will be covering a great deal of material and will therefore be moving quickly; as a student, you have a significant responsibility to keep up with the material outside of class. Some of the material presented in lecture will go much further than is provided in the textbook, while other sections will be more thoroughly covered in the text. You are responsible for learning the lecture and the reading material, as well as additional topics from discussion section. Powerpoint slides will be posted on the course webpage, and lectures may be livestreamed via Zoom (ID 311 745 010) to accommodate those in quarantine/isolation **if you alert me ahead of time.**

<u>Date(s)</u>	<u>Topic</u>	<u>Relevant Reading</u>
Feb 3-10	Membranes and Transport	CH 11
Feb 15-22	Biosignaling	CH 12
Feb 24	Intro to Metabolism	preface to Part II, CH 13
Mar 1-3	Glycolysis	CH 14 (pp 533-558; 565-end)
Mar 8-10	Citric Acid Cycle	CH 16
Mar 17-31	Oxidative Phosphorylation	CH 19
Apr 5-7	Photosynthesis	CH 20
Apr 12	Gluconeogenesis	pp. 558-565; Section 15.3
Apr 14	Glycogen Metabolism	Sections 15.4, 15.5
Apr 19-26	Fat Metabolism	CH 17; Sections 21.1, 21.4
Apr 29- May 3	Nitrogen Metabolism	CH 18, 22
May 5	Integration of Metabolism	CH 23

**Exams:**

- Exam 1 –March 15 (in class)
- Exam 2 –April 21 (in class)

Exam questions will come from all aspects of the course, including reading assignments, lecture material, problem sets, and discussion material. Per Chemistry Department policy, there are no make-up exams. If you miss an exam for a medical reason, you must ask your advising dean to communicate with Prof. Millard asap. The comprehensive final exam is scheduled by the Registrar.

If you have approval for accommodations on exams, please discuss logistics with Prof. Millard at least one week before the first exam.

**Class Participation:** You are expected to come to class prepared to participate. You are responsible for all material presented in each class meeting, as well as all assigned readings, which should be done before the relevant class. This includes problem sets, in-class problems, and discussion section. Attendance is expected unless for a documented medical reason; excessive absences will be penalized at Prof. Millard's discretion.

**Discussion Section and Problem Sets:** Good communication, both written and oral, is an essential scientific skill. You will have frequent opportunities to communicate your biochemical thinking both in class and in the weekly discussion section. Most weeks, you

will receive a problem set that you are to complete for the Friday class. Prepare a Word document with your answer and explanation typed up for each problem on its own separate page. (No handwritten problem sets will be accepted, although if there is a math problem, it's OK to do the calculations neatly by hand, take a picture, and paste that into your Word document.) Prof. Millard will announce in discussion which problem(s) you are to submit as a pdf file via the Moodle page each week, and you should be prepared to complete the submission immediately after class. During discussion, volunteers will present their answers for us all to talk about together.

To prepare for discussion section, you should get together with a study group to begin thinking about these problems shortly after they are assigned. The principal goal of these problem sets is to stimulate thoughtful discussion, not necessarily for you to obtain the "right answers." Please do not try to "check your answers" with Prof. Millard before discussion section. Prof. Millard will answer clarification questions only; one of the goals of the problem sets is for you to develop independent strategies for thinking deeply about the material.

Your discussion grade is based primarily on your preparation, your engagement, your thought process, and your abilities to communicate effectively and think on your feet.<sup>1</sup> You will receive feedback on your discussion performance when the first exam is returned; after that, you are free to check in with Prof. Millard again about your performance if you wish. Only medical absences are excused, and if you are absent for any reason, you must notify Prof. Millard asap, turn in your entire problem set before discussion, and submit your written answers to the case study via email by Monday at 9 AM. Additionally, it is recommended to have a friend Zoom you in if possible.

**Case Study Presentation:** You will obtain additional practice with scientific communication by making a short group presentation to the class during discussion section. General guidelines for this assignment are as follows:

- Your presentation should be ~15 minutes in length and include a handout that summarizes the case, poses discussion questions, and provides literature references.
- You will work in a group of two on this assignment (one group of three).
- Your case may be patient-focused, data-focused, or a hybrid of the two.
  - For patient-focused cases, you will present the medical history, lab findings, and treatment of a particular (fictional) patient, followed by discussion questions that relate the clinical findings to the underlying biochemistry.
  - For data-focused cases, you will present the background and results of an experiment, followed by discussion questions that relate the data to the underlying biochemistry.
- Your topic must focus on recent course material. Check with Prof. Millard before finalizing your topic to make sure that it is not already on a problem set or in-class problem.

---

<sup>1</sup> Grading for discussion is as follows: 3 maximum points for participation (+1 point for showing up on time, +0.5 points for actively discussing with your group; +0.75 points for thoughtful question/comment; +1 point for an insightful presentation of a problem); +3 maximum points for submitted problem (+2 points reflects an "honest effort"). Therefore, if you come on time, discuss with your group, and make two valuable contributions but you get NOTHING CORRECT ON THE PROBLEM SET, you could still earn 5/6 points that week.

- Within 24 hours following discussion, you must post your case on the course webpage and email your answers to your Prof. Millard. Make sure that your names are on your case study document.
- An excellent resource for developing medical cases is the National Center for Biotechnology Information (NCBI) resource “Online Mendelian Inheritance in Man.”
- Sign up for your preferred date on the Google doc linked on the course webpage by Feb 7. You can sign up as a group or as an individual.

**Assessment and Grading:** Your grade for this course will be calculated as follows:

	<b>with lab</b>	<b>no lab</b>
Hour Exams	35%	50%
Final Exam	20%	25%
Discussion (participation and problem sets)	20%	20%
Case Study Presentation	5%	5%
Laboratory	20%	---

**Intellectual Responsibility:** Honesty, integrity, and personal responsibility are cornerstones of a Colby education and provide the foundation for scholarly inquiry, intellectual discourse, and an open and welcoming campus community. These values are articulated in the Colby Affirmation and are central to this course.

Students are expected to demonstrate academic honesty in all aspects of BC368. Any written work submitted in your name is to be your work alone, except for the formal presentations done with a group, which should be equal effort. You are encouraged to discuss material for problem sets with others but merely copying answers is prohibited. Your answers must be in your own words, and you must cite any outside sources and collaborators. Cell phones and other portable electronic devices may not be used during exams for any reason. The only exception is a calculator.

Violation of any of these expectations constitutes academic dishonesty, which is a serious offense against the College. Sanctions for academic dishonesty are assigned by an academic review board and may include failure on the assignment, failure in the course, or suspension or expulsion from the College.