



**University of Pennsylvania**  
**The School of Liberal and Professional Studies**  
**BIOL2801 – Essentials of Biochemistry**  
**Course Syllabus**  
**Summer 2023**

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<b>Title</b>	BIOL2801 Essentials of Biochemistry	
<b>Course Units</b>	1.0 CU (3 hours/week)	
<b>Time</b>	Tuesdays and Thursdays 830-1030am	
<b>Location</b>	TBD	
<b>Instructor</b>	Ruth Elliott, MS	<a href="mailto:melli@sas.upenn.edu">melli@sas.upenn.edu</a>
<b>Teaching Assistant</b>	none	
<b>Office Hours</b>	Mondays, 430-630pm in zoom classroom Check canvas announcements for additional office hours	
<b>Appointments</b>	Ruth, email for appointment In the zoom appointment room Suite 100, 3440 Market St	

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## Welcome to Biochemistry!

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Biochemistry is one of my favorite topics. Who doesn't love knowing how living organisms 'work'? Adding the 'chemistry' component to biology allows us to see the mechanism by which living systems do what they do. The capacity to understand the etiology of disease, the wonders of our organ systems, and the maintenance of homeostasis amidst changes in the environment is compelling to many. But achieving this understanding is also daunting to us at times – it is much more challenging to explain 'how' something happens instead of simply stating 'what' happens. Seek true understanding of the concepts and search for foundational concepts when solving problems, and you will find you can actually do and even enjoy complex problem solving.

## Course Objectives

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BIOL2801 Essentials of Biochemistry is an intermediate level course covering the principles of modern biochemistry. Topics include protein structure, function, purification, separation, characterization; enzyme kinetics, catalysis and mechanism; structure, function and transport of biomolecules; carbohydrate and lipid metabolism and cellular energy transduction. The course will focus heavily on problem solving techniques, experimental design and analysis, as well as medical applications of basic biochemical concepts. Prerequisites for this course are BIOL1101-910 (Introduction to Biology A) and BIOL1102-920 (Introduction to Biology B) or equivalent. An additional prerequisite is CHEM2410-910 (Principles of Organic Chemistry I). I strongly suggest CHEM2410 or an equivalent course be taken before BIOL2801 as little to no experience in organic chemistry will produce a strong barrier to success in biochemistry. CHEM2420 (Principles of Organic Chemistry II) is recommended but may also be taken concurrently.

## Recommended Textbooks

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*Note: As a result of surveying students from previous semesters, I am now making this textbook a recommendation but not a requirement. Most students indicate that as a result of my providing the textbook problems in word format, providing the figures in lecture slides, and recording of the lectures each week, they do not utilize the textbook much. Students that generally use textbooks do find this one helpful, but most students report not using the textbook at all and still having success in the class. You know yourself, if you are generally a person who relies on the textbook to study, then get it. If not, then don't. Also this textbook is available in many libraries on campus to use in the library as well. Note, medical schools often use this textbook as well, so your purchase of it may be an investment.*

Nelson & Cox (2017) *Lehninger Principles of Biochemistry* (8th edition): W. H. Freeman & Company, New York (NY) [ISBN-13: 9781319228002]

Feel free to save money by buying used, renting, or purchasing the loose leaf or eBook version or the 6<sup>th</sup>/7<sup>th</sup> edition.

***Additional Recommended Textbook Sources or Supplements***

Nelson, Cox & Lehninger (2017) *Absolute Ultimate Guide for Lehninger Principles of Biochemistry* (7<sup>th</sup> edition) W. H. Freeman & Company, New York (NY) [ISBN-13: 9781464187971]

Amino acid quiz app – Student recommended and useful for memorizing the amino acids

**Availability**

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The instructor is available by email most days from 7am to 8pm. Please email rather than using the canvas messaging system. I generally try to respond to emails with 24h, but it is often much faster, especially when you have a pointed logistical concern or concise conceptual question. For example, if you write saying 'I am confused about HW3 question 4, here is my answer can you tell me what I am doing wrong?' this will not get answered quickly and likely not be answered to your satisfaction. Instead, I encourage you to spend time verbalizing a pointed question about a concept, an approach, or the problem so that I can answer much more quickly and you can learn more effectively.

The instructor is available for office hours in zoom as noted above. Office hours usually entail groups of students working together and with the instructors on quiz, homework, or practice problems. They are not for individual concerns.

The instructor is available for individual or small group appointments as well – email to set these up. I encourage you to use these times to discuss more individual or private matters or to ask a series of very pointed and direct questions about content or problems or projects.

**Schedule for the Course**

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See 'BIOL2801\_Summer2023\_Calendar' on the canvas site under 'Files' for the most updated schedule of lectures, assignments, reading assignments due dates and assessments for each day of class. Note that many of the due dates are subject to change throughout the semester. Generally, the course is divided into five modules in canvas or five sets of topics. Each module has a graded homework assignment, 1-4 graded quizzes, 2-5 lectures, and practice materials associated with it. The schedule of modules is below along with the other components and assignments included within each set of topics.

**Module 1 – protein structure and function**

**Module 2 – enzyme kinetics and mechanism**

**Module 3 – membranes and transport**

**Module 4 – carbohydrate metabolism**

**Module 5 – lipid metabolism and aerobic respiration**

**Schedule of Events, organized by module (and from the calendar):****NEW SCHEDULE COMING SOON****Structure of the Course Site**

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In canvas, there are five modules. The class will proceed in order of the modules listed and modules are organized by topic and due dates. Each module has a series of lectures you should watch before the indicated class date in the Lectures Pages for each week. You will take a quiz on these lectures at the beginning of class each day. Briefly, in class we will do problems related to the lecture material. Each module has an assigned homework assignment with it and these contain open-ended problems related to the lecture series in that module. Homework assignments and quizzes are graded for accuracy. You may work together for homework, but not for the quizzes. Practice problems and practice quizzes as well as their answers are also posted in canvas within each module. **See the 'Course Introduction' Video in the first module in Canvas.**

**Structure of the Course and Synchronous Class Sessions**

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This course is structured as a 'flipped' or 'reversed' classroom. Before each class you should have watched 1 lecture (1h) and come to class ready to take the quiz at the beginning of class. Class will occur on Tuesdays and Thursdays and will contain the problem-solving components that accompany the lectures as well as review. Though you spend time watching lectures out of class, coming to class will allow you to spend less time on the graded homework assignments and exam preparation.

Class sessions will occur on Tuesdays and Thursdays from 830-1030am which is within one of our scheduled class times. Most of the class activities/problems each week will be posted in a document called 'Class Problems\_Week X – Day Y' in the respective module. At the beginning of class, we might do a short review of the materials before the quiz. Then we will discuss the answers to in-lecture problems. We will use breakout sessions to work through in-lecture questions, practice and/or homework problems associated with that week's topics. Students are expected to come prepared to class to work on problems and work with their peers. You may be asked to present thoughts, opinions, and work on the problems in groups. Relevant portions of class will be recorded, but keep in mind, zoom cannot record breakout sessions and some students are not comfortable being in recordings their peers can view, so class is not recorded in full. I believe you will benefit from coming to class, but you are not required to do so. Most people are able to solve problems better if they at some point in the process brainstorm with and learn from their peers, which is how breakout sessions will be used. **See the 'Course Introduction' video in the first module in canvas for more information.**

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## Grading

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Students will be evaluated as follows

Midterm and Final Exam:	14% each, 28% total (1 midterm, 1 final)
Final Project:	15% (1 group presentation and 1 paper and peer review)
Homework:	8% each, 32% total (5 assignments, drop 1)
Quizzes:	2.5% each, 25% total (18 quizzes, drop 8)

The class is graded on a curve if the average is lower than an 88%. The average total grade is scaled to a 'B+'.

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## Description of Assessments

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### Exams

There will be two exams throughout the semester and both will be administered in canvas and are cumulative. Exam 1 will cover lecture material from May 23 – June 21 (Weeks 1 – 5 or Lectures 1-9). Exam 2 will cover lecture material from June 30 – July 26 (Weeks 5 – 10 or Lectures 10-18). Exams are similar to homework questions and are open-ended and require students to explain how they got their answer. Each exam will be released about five days before it is due. Each exam will be worth 140 points and you must work alone to complete it. Exam questions will be randomized for each student so no two people will take the exact same exam. Practice exams will be posted in canvas. Each exam is timed such that you have three hours to complete it, even though it is estimated it should take less than this amount of time. It is timed so that you both don't have to rush, and don't have to overextend yourself finishing the exam.

The exams are all cumulative, even though they are broken down by topic. The basics of amino acid structure, the basics of reactions – these are applicable to all contexts and so questions may be based on a metabolic context, but require understanding of amino acids and reactions still.

### Quizzes

Quizzes will be given daily in class and there are 18 total and they are open-book. Quizzes are 25 points each, and students can drop their EIGHT lowest quiz grades for any reason, including not feeling like taking the quiz. Students will have 20-30 minutes to complete the quiz at the beginning of each class. Quiz questions are mostly fill in the blank, true/false, short answer, or multiple choice questions. Each class, you will watch 1h of lecture online before class and the quiz on this material will occur at the beginning of that class. One exception to this schedule is the 1<sup>st</sup> and 11<sup>th</sup> quizzes will occur after their respective classes. For the 16 other quizzes, you will be quizzed on the material BEFORE we do problem solving on that material during class. Quizzes will be comprised of questions probing bird's

eye view concepts of the current lecture material. The EIGHT lowest quiz grades will be dropped at the end of the semester. **Practice quizzes are already present in canvas under 'Files→Practice Quizzes' or in the modules labeled 'Quiz X Practice Questions'. Answers are posted to practice quizzes as well in this same folder and under the blank quiz in the canvas module.**

## Homework

Homework will be assigned every 2 weeks and will focus on the lecture material from those 2 weeks. It is expected that most of your time devoted to this class will be spent on homework. Assignments will be uploaded in .pdf format to canvas in a single document before the deadline. You may upload a supplemental document with extra information if you so desire, but everything you want graded should be in a single document. Assignments are expected to be well written, professional, neat, concise, precise, and on time. Explain all answers and show all of your work, even if not explicitly requested. If you work with a study group, write the names of other group members at the top of your document. Additionally, if you work with a study group, sharing of group documents is strongly discouraged as at times two foolish students turn in this same document. If you work with a group, all answers you submit should be in your own words, and your work individual. Late assignments will not be accepted. Assignments are worth 80 points each. The lowest of 5 assignment scores will be dropped. Plan accordingly. **Short videos on the homework problems produced in class or office hours are often posted to help you get started on the HW questions. Check 'Class Recordings' for these videos on a regular basis.**

Tips on putting written work into electronic form:

<https://sas-lps.freshdesk.com/a/solutions/articles/42000094178>

## Group project/presentation

A group of 3 – 5 people will typically choose a topic – like a disease, or a group of diseases, or a group of pharmacological compounds. Each person in the group will prepare a 4-page paper, double spaced, on several sub-topics outlined in the 'Project and Paper Rubric' on canvas. The entire group will prepare a 10 – 15-minute presentation, depending on the number of groups, as well. The group project is worth 150 points. The documents are worth 75 points and the presentation 75 points. You will have an individual grade for the paper and a shared grade for the presentation. You are also expected to work with at least 2 other people for the group presentations and research paper. There will be no working alone on the group project. There will be opportunities for group or individual appointments on these projects throughout the semester so I can help direct your progress on the project. The rubric for this project will be posted under 'Final Group Project' in 'Files'.

### How to get the grade you desire

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**Study almost every day!** We are covering 14-18 chapters in 10 sessions. This means you must do a lot of reading and studying on your own and come prepared to class each week. With any complicated subject matter, daily studying in short segments is always better than cramming. Quizzes and assignments and weekly problem-solving sessions are encouragements for you to stay on top of the material.

**Do the practice problems.** Sometimes they appear on exams.

**Think big picture.** There are a lot of details, some of which you must know, but if you try and remember that many of the details are examples or consequences of big picture ideas, it will be easier for you to enjoy, appreciate, and remember some of the details. Most assignments and exams are NOT based on memorization but on problem solving. And you get cheat sheets for every exam.

**Ask questions.** There is much for us all to learn. First of all, if you don't ask, I don't know you don't understand. Second, your question might be one of mine, and you might be encouraging me to learn more too.

**Study with others and do the problems.** I plan to assign a literal ton of practice problems and homework problems. Do them with others, talk about them, try them again in new ways. Biochemistry is essentially a discipline that teaches you how to think about and solve real-world problems. You can study biochemistry by doing biochemistry.

I cannot emphasize enough the importance of **doing problems**. Use the end of chapter problems (whose solutions are in the back of the book) as practice. Redo the practice problems from class. Try the problems several times before giving up or asking for help. You should be spending 3 – 4 or more times the amount of time you spend reading on doing problems. Students that get A's are students who do not procrastinate on doing problems, and who excel at trying problems, even if at first they fail, until they master them.

### Working with Study Groups

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You are encouraged for homework assignments to work in study groups. However, you must submit assignments in your own words and you must identify the other students with which you have worked. Additionally, you are encouraged to work and discuss problems in groups during class. In canvas, there is a canvas conferencing tab which you have access to. You are able to setup meetings, record, and do



many other things in this conferencing application but it only works within the group of people in the class. You are encouraged to use Slack, Google Hangouts, Zoom, BlueJeans, Facebook Messenger, Facetime, Skype or any other video conferencing software to establish and maintain study groups for your classes.

### **Re-grade Policy**

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I try my best to keep you apprised of your current “grade” in the class by returning assignments quickly and posting averages on assignments in the form of announcements. Quizzes have simple answers (true/false, single words, matching) and thus instructor grading errors are easy to catch and will be corrected should the student provide a) a short explanation and b) a picture of the quiz itself via email to the TA. Homework assignments are graded entirely by the TA. Often you may feel your answer was clear or correct, but comparing your answer to the key or to a student who scored perfectly, will show your flaw. If you believe the mistakes add up to 2 whole points on a homework assignment, you may request a formal re-grade from the TA. The re-grading is entirely at his/her discretion as they are aware of the rubric they used to grade that assignment. For exams, the errors you believe to exist must total 2 points of a 60-point exam. These re-grade requests should be emailed to the TA and instructor (on the same email). However, we may take that opportunity to re-grade the entire exam, which may cause you to lose points as well.

### **Formal re-grade requests should include**

1. A short description of the grading error
2. A picture of the problem in question from your original exam or quiz, or a simple reference for homework assignments as these will be submitted online.

### **Code of Academic Integrity**

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The University of Pennsylvania Code of Academic Integrity will be strictly enforced. Any violation will result in failure in the Summer2021 BIOL203-601 Biochemistry course. Since the University is an academic community, its fundamental purpose is the pursuit of knowledge. Essential to the success of this educational mission is a commitment to the principles of academic integrity. Every member of the University community is responsible for upholding the highest standards of honesty at all times. Students, as members of the community, are also responsible for adhering to the principles and spirit of the Penn Code of Academic Integrity. More details about this policy can be found online at <https://catalog.upenn.edu/pennbook/code-of-academic-integrity/>.

**University Services**

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**Penn Libraries:** Students can access all online resources available at the University of Pennsylvania by using the website [www.library.upenn.edu/](http://www.library.upenn.edu/) and logging in with their PennKey and password. *Students wishing to visit the Library in person and borrow books will need to get a PennID card first.*

**Student Disability Services (SDS):** Although the self-identification process is confidential and completely voluntary, it is required for those requesting accommodation. Student Disability Services (SDS) can be reached by phone at 215.573.9235, by TDD at 215.746.6320 or online at [https://www.vpul.upenn.edu/lrc/sds/contact\\_us.php](https://www.vpul.upenn.edu/lrc/sds/contact_us.php).

**Add/Drop Period:** Students may drop a class before the end of the first two weeks of an accelerated, eight-week session by using Penn InTouch. Please see the LPS Academic Calendar for relevant dates and links (<https://lpsonline.sas.upenn.edu/student-resources/academic-calendar>). Failure to attend/participate in a course does not automatically result in being dropped from the course. Courses that are dropped will no longer appear on a student's transcript. <https://www.sas.upenn.edu/lps/lps-online/form/course-withdrawal>

**Withdrawing from a course:** Students may withdraw from a course through the fourth week of the accelerated, eight-week session by meeting with an advisor and completing a form with the permission of the instructor.

**Online Learning Team:** There is 24/7 technical support available for your course. If you encounter technical difficulties and need immediate assistance, please call 1-833-283-2987. Email [studentithelp@upenn.edu](mailto:studentithelp@upenn.edu) for any technical concerns.

**Penn LPS Online Helpdesk** (<https://sas-lps.freshdesk.com/support/home>)

- to try troubleshooting on your own or live chat with a technical support staff member. In addition, you can reach out to us via email at [online-learning-help@sas.upenn.edu](mailto:online-learning-help@sas.upenn.edu) and we will respond to you within 24 hours.

**Counseling and Psychological Services (CAPS)** (<https://caps.wellness.upenn.edu/>)

Call 215-898-7021 24/7 for a mental health crisis involving you or any member of the Penn community

Drop-in for on-campus students:

3624 Market St | 1<sup>st</sup> Floor West

M|F 9am-5pm

T|W|R 9am-7pm

Saturday 10am-3pm



