

CHEM 327: Biochemistry 2
Spring 2022
TR 9:25 – 10:40 am
Roddy 153

Instructor: Melissa A. Mullen Davis Pronouns: she/her/hers
e-mail: melissa.mullendavis@millersville.edu Google Voice Phone: 302-307-1741
Office: Caputo 218 Office Phone: 717-871-7439
Office Hours: Mon 10-12, Tues 11-12, Thurs 11-12, Fri 10-11, and by appointment.
In person or virtual (zoom)

Lab: Wed 2:00 pm – 4:50 pm

Course Description: CHEM 327 is a continuation of *Biochemistry I*. The major focus is to understand the chemistry behind the function of biological compounds involved in cellular processes and metabolic pathways. Specific topics include enzyme mechanisms and energetics, membrane dynamics, replication, transcription, protein translation, and signal transduction. Additionally, metabolism of lipids, amino acids, and nucleotides is studied in detail (3 hrs lecture/3 hrs lab).

Pre-requisite or co-requisite: CHEM 326 (grade of C- or better).

Course Materials and Readings:

- Registration on D2L and access to course and laboratory materials posted on D2L.
- Achieve Access (available online with e-text *Principles of Biochemistry*, Nelson & Cox, 8th ed)
- Optional Hardcopy Text. Options include: *Lehninger; Voet, Voet, and Pratt; Garrett & Grisham*
- Laboratory notebook: permanently-bound composition notebook. A variety of colors and styles are available for purchase in lab for \$1.

Course Overview:

This course is designed to use foundational information in Biochemistry to understand complex topics in metabolism including glucose, lipid, amino acid, and nucleic acid metabolism and regulation and the biochemistry behind replication, transcription, and translation. Application to human health and disease will be highlighted.

Course Objectives:

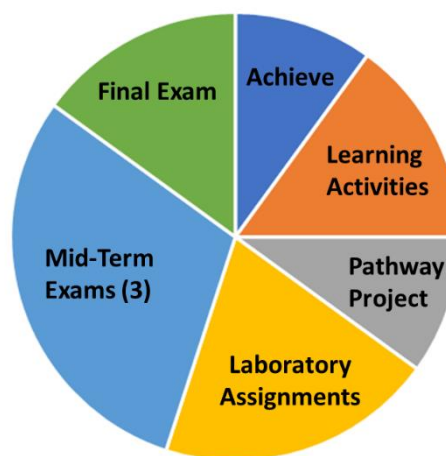
The main goal of this course is to apply biochemical principles to metabolism and biological systems. Students actively engaged in this course should be able to:

- Integrate chemical characteristics of major types of biochemical molecules with their biological relevance.
- Describe protein structure, chemical mechanisms, and energetics relevant to enzyme function in metabolism.
- Recognize and outline biosynthetic pathways and metabolism for amino acids, proteins, nucleotides, nucleic acids, and lipids and how they are regulated and integrated with other major pathways.
- Describe chemistry relevant to nucleic acid structure, function, and processing.

- Describe cellular transport and signal transduction processes and the relevance of dynamic membrane structures.
- Read and evaluate published primary research in biochemistry.
- Develop advanced laboratory skills and apply relevant biochemical principles for understanding and troubleshooting work in the biochemistry lab.
- Record and analyze biochemical data accurately and effectively.

Evaluation of Learning:

Achieve Homework	10%
Engagement and Learning Activities	15%
Pathway Project	10%
Laboratory Assignments	20%
Mid-Semester Exams (3)	30%
Comprehensive Final Exam	15%



Final letter grades will be assigned on a standard plus/minus scale.

Homework (10%):

Mastery of chemical and biochemical principles is developed through *practice*. Opportunities for you to interact with course content is available online through Achieve. These problems will include **required homework** and practice/review problems or activities. While only scores on assigned homework will count towards the course grade, you are encouraged to use a variety of resources that are helpful for your learning. Homework deadlines will be **11:59 pm** the day they are due, frequently on Sunday with occasional mid-week assignments as needed (such as before an exam).

Engagement and Learning Activities (10%):

In addition to online homework, we will also have a variety of assigned "Learning Activities" designed to help you practice and gain mastery of course material. These will be assigned in-class, included on Road Maps, and posted on D2L. These could be homework assignments, quizzes, guided notes, extra practice problems, class surveys, post-exam surveys, reflection questions, etc.

Drug Function Project (10%):

This semester you will investigate the mechanism of a unique pharmaceutical drug that regulates an enzymatic function related to disease. Through scientific literature you will learn about the drug structure and function, relevant biological pathway, and the enzyme regulated. You will prepare and present a poster about your findings. This project will be scaffolded through several assignments and an official prompt and specific assignment questions will be provided later in the semester. Guidance and assistance in navigating scientific literature will be provided.

Exams:

We will have three exams during the semester and one comprehensive final exam that will require the full class period and will test your ability to integrate fundamental course concepts on the applied, analytical, and synthetic levels. Exam dates are listed on the schedule.

Make-up Policy: If you know you will miss an exam ahead of time (for an absence excused based on Millersville's approved guidelines), you must inform me one week in advance, ideally in person. You will be expected to take the exam before the scheduled date. If you are sick on the day of an exam, we will work together for you to make up the exam as soon as possible. Any unexcused absence from an exam will result in a zero.

Testing Accommodations: Any student who meets the eligibility requirements to receive academic accommodations through learning services should speak with the Office of Learning Services in Lyle Hall as early in the semester as possible. You should give me a Testing Accommodation request form ("green sheet") as soon as possible and plan to take quiz/exams on the same day and time at the Office of Learning Services. For more information see: <http://www.millersville.edu/learningservices>

Laboratory

Biochemistry 2 laboratory will focus on providing you will additional laboratory experience in common techniques used in biochemistry and molecular biology. We will have five (5) laboratory experiments some of which will require several weeks to complete and additional laboratory activities. Please let me know if you have any special circumstances (allergies, pregnancy, etc) that might require alternate experimental arrangements for you to work safely in lab.

- Lab Evaluation for each experiment will consist of:

Pre-Lab Questions	5 pts
Data Analysis/Post-lab	15 pts
Laboratory Notebook	5 pts
- Laboratory activities will be worth ~15 pts
- You are expected to respect and follow all safety instructions given in lab.
- Information about laboratory experiments (background info, protocols, information, representative data) will be posted and accessible on D2L.
- Pre-lab questions will be completed in D2L and will be due **8 am on Wednesday**.
- Lab assignments (D2L data file or quizzes) should be submitted to D2L by the deadline.

Tentative Course Schedule*

Date	Chapter	Topic	Lab
1/18	14, 16	Glycolysis and Gluconeogenesis, Glycogen	Check - in / Welcome/Overview
1/20	14	Glycogen Metabolism and Regulation	
1/25	17	Lipid Transport and Oxidation	Protein Isolation and Stability
1/27	21	Lipid Biosynthesis; Regulation of Lipid Metabolism	
2/1	21	Cholesterol Mechanism and Therapies	
2/3	18	Protein Catabolism	
2/8		Exam 1; THE due 2/10*	Enzyme Purification and Activity
2/10	18	Amino Acid Catabolism, Glc-Ala Cycle	
2/15	18, 22	Urea Cycle, Tryp and AA Biosynthesis	
2/17	23	Organ Specialization, Biochemical Signaling	
2/22	12	Biochemical Signaling	
2/24	23	Metabolic Disorders	
3/1		Exam 2; THE due 3/3*	
3/3	various	Metabolic Disorders / Case Study	
3/7-11		NO CLASSES - SPRING BREAK	
3/15	22	Purine and Pyrimidine Biosynthesis	Protein Modeling and Poster Preparation
3/17	22	RNR, TS, Nucleotide Catabolism	
3/22	22	Nucleic Acid Metabolic Disorders	GMO PCR Experiment
3/24	24	Nucleic Acid Structure and Topoisomerase	
3/29	25	DNA Replication and Repair	
3/31	26	Transcription	
4/5	26	Transcription Factors; Nucleic Acid-Protein Interactions	Antibiotic Studies
4/7		Exam 3; THE due 4/12*	
4/12	26	RNA Processing: Capping, PolyA/U	Lipid Analysis, Poster Peer Review
4/14	26	RNA Splicing; RNP Complex Investigation	
4/19	27	Translation: tRNA and tRNA synthetases	
4/21	27	Ribosome Structure and Function	
4/26	28	Regulation of Gene Expression	Poster Session
4/28	28	Regulation of Gene Expression	
5/4		Final Exam: Wed 5/4, 2:45-4:45 pm	

* subject to change

Course Policies:

Class Attendance and Participation

You are expected to attend all classes prepared to actively participate in the classroom, including asking questions, responding to questions, and contributing to group, class, and laboratory discussion. You are responsible for all material presented in class and distributed via D2L. You are also expected to complete all of the Laboratory Experiments. Only graded work missed for an absence excused based on Millersville's approved guidelines (found online and at the end of the syllabus) may be made up. Please contact me as soon as possible to reschedule. Any graded work conducted outside the scheduled time may differ significantly in form and exact content from the in-class version.

COVID Policy

Despite hopes to the contrary we are still in the middle of the COVID-19 pandemic with new COVID variants and young children that still are not able to be vaccinated. We must continue to operate under unusual and constantly changing conditions.

- Please take great precautions and follow recommendations including wearing a mask especially in enclosed spaces and get vaccinated if you are not already. If you have any signs of illness or exposure to someone who is COVID-positive, stay home and get tested.
- I highly recommend that students come to class to maximize learning of Biochemistry. However, if you feel unwell please stay home. If you have been exposed to someone who tested positive for COVID-19 or are awaiting COVID test results after being symptomatic please stay home.
- If you are unable to attend class, please contact a classmate to obtain notes. Any materials used will be posted on D2L.
- If you are unable to attend lab, please contact me for a suitable alternative assignment.
- Office hours may be held virtually via Zoom and in-person. You may attend in any modality you prefer. I am also able to schedule in-person or virtual meetings to discuss course content.
- If you are experiencing a prolonged illness (more than two (2) weeks), please contact me.
- It is possible that students and instructor might have frequent and unexpected childcare or school closures. If you are a primary caregiver of a child (e.g. parent or guardian), please contact me and we can set up a custom plan for how to manage attendance and assignments if there are closures. Likewise, I will share plans if I am unable to attend in person.
- If there are other situations that will impact a student's ability to participate in this course, please contact me as soon as possible.

Use of Electronic Equipment:

Studies show that learning in a classroom is enhanced in a personal screen-free environment. Therefore, the use of cell phones, laptops, tablets, etc. is strongly discouraged in class unless otherwise approved by me in advance. Distractibility is real and puppy videos are adorable.

Computer Resources

Students are expected to use D2L for CHEM 327. This provides mechanisms for contact, distribution of information, and data, submission of written work, completion of peer reviews, etc. Students are also responsible for all course information sent to their campus email address.

Diversity, Inclusion, and Anti-Racism Policy

This course is a judgement free and anti-racist learning environment. Our class includes students from a wide variety of social identities and life circumstances. Everyone will treat one another with respect and consideration at all times or be asked to leave the classroom.

As your instructor I will:

- Learn and correctly pronounce everyone's name
- Use correct pronouns for those who wish to indicate this to me/the class
- Work to accommodate/prevent English language related challenges

If you tell me that you are having trouble, I will not judge you or think less of you. You do not owe me an explanation of your health (physical or mental) or the health of your loved ones; but you are welcome to tell me and I will listen. If I can not help you, I will find someone who can. If you need help or more information, please ask and I will work with you.

If we have any virtual sessions children and pets are welcome to attend live sessions as long as you are considerate of other learners. In general, I suggest keeping your microphone muted when not speaking to avoid outside noise for the rest of the class.

Academic Honesty

Students are expected to abide by the policy outlined by Millersville University shown below. Students will collaborate on collecting, interpreting, and reporting data. Students are expected to contribute equally on collaborative work. Fabrication of data or plagiarism in preparing reports will NOT be tolerated in this course. Students should not post course material on online study sites such as Chegg. Anyone caught cheating in these ways will be assigned a score of zero on the work.

According to Millersville University's Academic Honesty Policy: *"Students of the University are expected to be honest and forthright in their academic endeavors."* If you break the academic honesty policy, there are severe penalties. A failing grade will be assigned and you may be prosecuted by an Academic Review board. Actions that violate the Academic Honesty Policy are:

1. Plagiarism: inclusion of someone else's words, ideas, or data as one's own work.
2. Fabrication: falsification of research or other findings.
3. Cheating: the act or attempted act of deception by which an individual tries to misrepresent that the individual has mastered subject matter in an academic project or the attempt to gain an advantage by the use of illegal or illegitimate means. Submitting in-class participation cards for another student is considered cheating.
4. Academic Misconduct: violation of University policies by tampering with grades or participating in the distribution of any part of a test before its administration.

Official Attendance Policy

1. Students are expected to attend all classes. It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses class for an officially excused reason, then the student is entitled to make up the missed work but only at the convenience of the faculty member. Responsibility for materials presented in, assignments made for, and tests/quizzes given in regularly scheduled classes lies solely with the student.

2. The Millersville University policy states that faculty will excuse absence for the following reasons:
 - a. personal illness
 - b. death or critical illness in the family
 - c. participation in a university-sponsored activity
 - d. jury duty
 - e. military duties
 - f. religious holidays
3. Faculty judge the validity of student absences from class within the University's approved guidelines and may require documentation for excuse absences. Faculty will evaluate any reason, other than those listed above, for a student missing class and determine whether the absence is justified. In these circumstances, a student may make up missed work at the discretion of the instructor.
4. In the case of foreseeable absences, students are encouraged to notify the faculty member in advance. A student who will miss class due to participation in an official University activity must notify the instructor well in advance of the activity to assure that the absence is excused.
5. For more information: www.millersville.edu/registrar/faculty/attendance_policy.php

Title IX Statement

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report to the person designated in the University [Protection of Minors policy](#) sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.**

Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: www.millersville.edu/titleix

Counseling Reminder

Students sometimes face mental health or drug/alcohol challenges in their academic careers that interfere with their academic performance and goals. Millersville University is a caring community and resources are available to assist students who are dealing with problems. The Counseling Center (717-871-7821) is an important resource for both mental health and substance abuse issues. Additional resources include: Health Services (717-871-5250), Center for Health Education and Promotion (717-871-4141), Campus Ministries, and Learning Services (717-871-5554).

Americans with Disabilities Act

Millersville University is committed to equality of opportunity and freedom from discrimination for all students, employees, applicants for admission or employment, and all participants in public University-sponsored activities. In keeping with this commitment, and in accordance with the Americans with Disabilities Act (ADA) the University will make every effort to provide equality of opportunity and freedom from discrimination for all members of the University community and visitors to the University, regardless of any disability an individual may have. Accordingly, the University has taken positive steps to make University facilities accessible to individuals with disabilities and has established procedures to provide reasonable accommodations to allow individuals with disabilities to participate in University programs. The University administration and management are obligated to report any allegation of discrimination to the appropriate office as defined in this policy.

Please let me know how I may make accommodations in the classroom setting that will enhance and support your learning.