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**CHEM327**  
**Biochemistry II**  
**Spring 2023**

<b>Dr. Aimee L. Miller</b> 717-871-7414 Lecture: Roddy 153 Tue & Thu: 9:25 - 10:40 Lab: Caputo 225 Wed: 2:00 - 4:50	<b>aimee.miller@millersville.edu</b> Office Hours: Caputo 325 Mon: 10:30 - 12:30 Tues: 11:00 - 12:00 Thur: 11:00 - 12:00 <i>Alternate times by appointment</i>
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**Course Description**

Chemistry 327 is the second semester course in biochemistry. The major focus is to understand the chemistry behind the function of biological compounds involved in cellular processes. 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)

**Prerequisite:** CHEM326 (C- or higher)

**Materials and Supplies**

- D2L course access (Millersville University)
- Achieve Essentials access (available online) for required online homework
- Open access text for reference: *Biochemistry Free For All* (Ahern/Rajagopal/Tan)
- Laboratory background & protocols (available in D2L)
- Laboratory notebook: permanently-bound composition notebook

**Course objectives:**

*After completing this course, students actively engaging in the learning process should:*

- Integrate chemical characteristics of a wide range of biochemical molecules with their biological relevance
- Describe 3D protein structure, chemical mechanisms, and energetics relevant to enzyme function
- Recognize and outline biosynthetic pathways and metabolism for amino acids, proteins, nucleotides, nucleic acids, and lipids
- 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

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**Course Policies**

This class adheres to policies as outlined by Millersville University ([links to full policies in D2L](#)).

**Class Attendance:** Students are responsible for material presented in class or distributed via D2L or MU e-mail. Only work missed for an absence excused based on Millersville's approved guidelines may be made up. Any exam conducted outside the scheduled time may differ significantly in form and content from the in-class exam, including an oral portion.

**Academic Honesty:** Students are expected to conduct all course work in an honest and ethical manner, consistent with Millersville's policy. Cheating on coursework bypasses the learning process and will NOT be tolerated. Anyone caught cheating will be assigned a score of zero on the work. Students should also avoid plagiarism of text or ideas in any coursework.

**Cooperative Environment:** Students are expected to be actively engaged in meaningful and respectful interaction in the classroom and lab. Questions, comments, and discussion are encouraged. Please feel free to approach me with any special concerns you have. Additional resources are available in the Office of Learning Services and Tutoring Center and across campus.

**Homework:** Mastery of chemical principles is developed through practice. In addition to traditional text resources, opportunities for students to interact with course content will be available online through Achieve. This will include **required homework** problems.

**Topic Articles:** Students will identify and read primary research articles on topics related to material covered in class. Articles should be printed in hard copy and annotated with highlights of key information, comments interpreting the results and figures, questions, and ties to class material. One paper will be submitted before the beginning of the class following each unit exam.

**Laboratory:** Laboratory provides a place where learning is enhanced by application. Planned projects allow deeper exploration into functions of biological molecules. Students must complete every experiment. Please keep me informed of any special needs you have for completing lab requirements, and contact me immediately if you have an excused absence that conflicts with your scheduled work. Students are expected to respect and follow all safety instructions given in lab. Please notify me if you have any special circumstances (like allergies or pregnancy) that might require alternate experimental arrangements for you to safely work in lab.

**Poster:** Each lab pair will research, prepare, and present a poster about a pharmaceutical drug that regulates an enzymatic function related to a disease. Each poster should include general information, drug structure, diagram of the relevant biological pathway, and a protein model the students generate from a published crystal structure, highlighting the relevant protein-drug interactions. Detailed instructions, a template, and resources are available in D2L.

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**Grading**

<b>Lecture</b>	Homework & Learning Activities	8 %
	Topic Articles	5 %
	Poster Project	10 %
	Exams	40 %
	Final	15 %
<b>Lab</b>	Notebook/Reports/Worksheets	22 %

*NOTE: You must earn at least 60% in the lecture portion to pass Chem327. Your final grade will be assigned based on combined lecture and lab scores.*

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**Letter Grade Correlation**

<i>Grade</i>	<i>%</i>	A	93.0 - 100.0	A-	90.0 - 92.9
B+	87.0 - 89.9	B	83.0 - 86.9	B-	80.0 - 82.9
C+	77.0 - 79.9	C	73.0 - 76.9	C-	70.0 - 72.9
D+	67.0 - 69.9	D	63.0 - 66.9	D-	60.0 - 62.9
F	< 60.0				

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Lecture Schedule (tentative)	Test Schedule (tentative)
<u>Chemistry of Amino Acids &amp; Enzymes</u> Enzyme Mechanisms, Regulation & Movement, & Amino Acid Metabolism	Exam 1: Thur, Feb 16 Topic 1: Tues, Feb 21
<u>Chemistry of Nucleotides &amp; Nucleic Acids</u> Nucleotide & Nucleic Acid Metabolism, Replication, Transcription & Translation	Exam 2: Thur, Mar 23 Topic 2: Tues, Mar 28
<u>Chemistry of Lipids &amp; Membranes</u> Membranes, Transport Mechanisms, Lipid Metabolism & Signal Transduction	Exam 3: Thur, Apr 20 Topic 3: Tues, Apr 25
	FINAL: Wed, May 6 at 2:45 pm <i>Comprehensive final over the semester</i>

Laboratory Schedule (tentative)	
Jan 18 & 25	Protein Isolation and Stability (Due: Feb 1)
Feb 1	Protein Modeling Activity (submitted by end of lab) Poster Topic Selection completed
Feb 8 - Mar 1	Enzyme Purification, Activity & Electrophoresis (Due: Mar 15)
Mar 8	No Lab: Spring Break
Mar 15	Combinatorial Chemistry & Antibiotics (Due: Mar 22)
Mar 22	Bioinformatics Activity (submitted by end of lab)
Mar 29 & Apr 5	PCR & DNA Electrophoresis (Due: Apr 12) Poster Draft completed
Apr 12 & 19	Lipid & Cholesterol Analysis (Due: Apr 26)
Apr 26	Poster Session 3 <sup>rd</sup> floor hallway

#### Laboratory Policies

- Students are expected to access lab information via D2L. This will provide a mechanism for contact and distribution of information or representative data if necessary.
- Students are expected to respect and follow all instructions related to safe work in lab, appropriate collection of waste, and maintenance of lab equipment and space.
- Please notify me if you have any special circumstances (allergies, sensitivities, or pregnancy) that might require alternate lab arrangements in CHEM327.
- Occasionally, advanced laboratory work in biochemistry does not produce the expected results. Students are expected to engage in learning relevant troubleshooting as well as concepts behind the experiment.

#### Lab Evaluation:

##### Attendance/Completion/Citizenship (60 pts):

Students are expected to attend every lab session and participate in the outlined work. Please contact me immediately if you have an excused absence that conflicts with your scheduled work. All data and analysis must be submitted for each experiment. Most experiments will involve work over more than one week. Your lab summary will generally be due the week following the *completion* of the last lab work for a given experiment. However, notebook pages should be submitted at the end of each lab work day. Worksheet activities should be completed by the end of the lab day. Scores will be reduced for late or incomplete submissions.

Multiple sections of labs work in the same space each week, so students are expected to treat the lab space and equipment with care. Scores will be reduced for failure to maintain a safe and clean environment for everyone to use.

##### Purpose/Pre-Lab Questions (10 pts):

Instructions will be provided and are formatted to allow you to tape them directly into your notebook for reference during lab. For each experiment we undertake, students are expected to review the background information and write a short statement of the overall **purpose** in their notebook. This should include information regarding what biological property or system will be studied and the methods used for the investigation. You should also answer in your notebook any pre-lab questions listed in the lab instructions. This information should be scanned and submitted electronically **BEFORE** beginning each experiment.

##### Lab Notes/Data Record (15 pts):

Every scientist should keep accurate and complete records as documentation of their research. Students will work in pairs to complete lab work and analyze data. However, each student should maintain an independent data notebook. Laboratory notebooks provide an official record of the rationale, procedures, observations, data collected, and interpretations relating to scientific research. You should record key experimental information and all primary data directly into your notebook so that you have everything needed for understanding your work and doing any required analysis. This information does not have to be neat but should be clearly labeled. At the end of each lab, you should scan and submit notebook pages from that day.

##### Data Analysis/Lab Summary (15 pts):

Your final report should summarize your overall work and discuss interpretation of the data collected in lab. Key points that should be addressed are provided in protocols. Graphs, images, or other data analysis produced from your recorded data should be included in your lab summary along with appropriate labeling and captions. When using linear regression analysis, both the equation of the line and the  $R^2$  value should be displayed. Data tables are needed only if they show analyzed results beyond the primary data recorded by hand during the lab. You also need to clearly show an example of all calculations used for data analysis, including any data manipulations made in Excel worksheets. These may be done by hand and captured for inclusion in your summary; they do not need captions.

The summary is also where you should note any problems that may have been encountered during experimentation and explain the impact they may have had on your final results or interpretation.