

## CHEM 117: Biochemistry

### Instructor

Prof. Jane M. Liu (HSC-212)  
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x3303

### Class

TTh 11:50-1:05  
BC-218

### Office Hours

M and W 10-11 am; Th 2-4pm

### PRE-REQUISITES: CHEM 26

### COURSE OVERVIEW

This upper-level course, for those students with a background in both general chemistry and organic chemistry, will address the following questions:

- **How does the shape, structure and functional groups of macromolecules and metabolites relate to their biological reactivity and function?**
- **How do we isolate a specific protein of interest from a cell?**
- **How do we study an enzyme's activity?**

The study of biochemistry investigates the interplay between biological macromolecules such as proteins and nucleic acids, and low molecular weight metabolites (such as the products of glucose metabolism). In this course, you will apply your knowledge of intermolecular forces, thermodynamics (when a reaction occurs), chemical kinetics (how fast a reaction occurs), and chemical structure and functionality to understand how biological molecules (and life) work.

Learning outcomes: The successful completion of this course will contribute to your

- Ability to problem solve
- Ability to think critically
- Ability to apply chemical knowledge to solve problems involving biological molecules
- Ability to work with others
- Ability to learn independently
- Ability to process information, interpret data and develop hypotheses

### COURSE OBJECTIVES

- Be able to describe/identify the forces that direct/stabilize different levels of protein structure
- Be able to predict how changes in amino acid (or nucleotide) sequence can affect macromolecular structure and function
- Be able to explain how enzymes are able to affect reaction rate enhancement
- Be able to articulate and apply what the enzyme parameters of  $K_M$ ,  $V_{max}$ ,  $k_{cat}$  and  $k_{cat}/K_M$  tell us about an enzyme
- Be able to describe the interactions of biomolecules both quantitatively and qualitatively
- Be able to understand the flow of metabolic intermediates through a pathway and communicate information about metabolic pathways using diagrams
- Be able to describe multiple experimental methods used in biochemistry, interpret data from these methods to form conclusions, and develop a testable hypothesis to answer a question

## COURSE MATERIALS

- Berg JM, Tymoczko JL and Stryer L. *Biochemistry* (7<sup>th</sup> edition). ("Stryer")
- Loertscher J and Minderhout V. *Foundations of Biochemistry* (3<sup>rd</sup> edition). ("FOBC")

## COURSE OVERVIEW

**Classroom:** The classroom part of this course will consist of lectures and activities involving team learning and problem solving. After completion of an activity in class, you are expected to do the assigned readings and homework.

### Assessments

#### Final Grade Calculation

Mid-term exams:	25%
Final exam:	20%
In-class participation	10%
Homework/Quizzes	20%
Laboratory:	25%

#### Grading Scale

A	93-100	C	73-76
A-	90-92	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C+	77-79	F	≤59

**Exams:** The exams will be comprised of short answer and short essay questions. The questions will be drawn from lectures, in-class activities and discussions, as well as relevant primary literature that you may not have been previously assigned. No make-up exams will be given. If you know in advance that you will miss an exam, please notify Prof. Liu at least one week ahead of time so that alternative arrangements can be made. If you miss an exam due to a documented health or family-related emergency, your other two exams will each count 22.5% of your total grade. **The final exam will be cumulative.**

**In-class participation:** Please be respectful of me and your fellow classmates and show up to class on time. In addition to mastering the material yourself, you are responsible for assisting the other members of your team in their understanding of the material. For this reason, attendance is required. *You are allowed two unexcused absences without penalty.* Your participation grade will be determined by your attendance record, the completions and quality of your Pre-Activity Assignments, level of involvement during in-class activities, and by the quantity and quality of your contributions during in-class discussions. A rubric for how participation and attendance will be evaluated is provided for you on the course Moodle site.

**Homework/Quizzes:** Some class assignments and all assigned Skill Exercises will be graded and quizzes will periodically be given in class. These quizzes will be cumulative, although an emphasis will likely be placed on more recently covered material. Students must show up on time; no time extensions will be permitted. There will be no make-up quizzes.

**Laboratory:** The purpose of *doing* biochemistry is to gain experience in experimental methods that you'll be reading about throughout the semester. Attendance on your scheduled lab day is expected. Unexcused absences from lab may not be made up and you will receive no credit for that lab. Chronic laboratory absences will lead to severe penalties, and **missing more than 3 lab periods** without making up the activity will lead to failure of the course.

**Late policy:** For all assignments, late work will be accepted. However, for every 24 hours that the assignment is tardy, a 10% deduction will be applied to your grade on that assignment.

**Special circumstances:** If there are special circumstances, such as illness or other form of emergency, which should be taken into account with regard to any of the stated class policies, please inform me as soon as possible so that alternative arrangements can be made.

**Academic accommodations:** Should you require academic accommodations, you must file a request with the Office of Disability Services (BC 119, extension 3327). It is your responsibility to self-identify with the Office of Disability Services and to provide faculty with the appropriate documentation from that office at least one week prior to any request for specific course accommodations. There are no retroactive accommodations.

**Academic ethics and integrity policy:** You are expected to abide by the Drew University Standards of Academic Integrity. For the official policy go to: [http://www.depts.drew.edu/composition/Academic\\_Honesty.htm](http://www.depts.drew.edu/composition/Academic_Honesty.htm). Plagiarism, whether deliberate or unintentional, and cheating on examinations, are not acceptable. Any such incidents will be referred to the Academic Integrity Committee.

**Schedule (Subject to Change):**

Week	Date	Topic
1	8/30	Introduction to Biochemistry
	9/1	Intermolecular forces and water
2	9/6	Amino acids and peptide bonds
	9/8	Protein folding
3	9/13	More protein folding
	9/15	Working with proteins
4	9/20	Working with proteins (continued)
	9/22	Enzyme catalysis
5	9/27	Enzyme Kinetics
	9/29	Enzyme Inhibition
6	10/4	Enzymes
	10/6	<b>Exam 1</b>
7	10/11	<b>Reading Day – No class</b>
	10/13	Hemoglobin
8	10/18	Lipids
	10/20	Membranes and membrane proteins
9	10/25	Signal transduction
	10/27	Metabolism
10	11/1	More metabolism
	11/3	Glycolysis

11	11/8 11/10	More glycolysis Gluconeogenesis
12	11/15 11/17	Citric Acid Cycle Oxidative Phosphorylation
13	11/22 11/24	<b>Exam 2</b> <b>Thanksgiving – No class</b>
14	11/29 12/1	Nucleic Acids / Primary Literature Primary Literature