University of Denver • Spring 2020 • Chemistry & Biochemistry 3811

Biochemistry- Proteins

CLASS MEETINGS

MWF 1:00–1:50 p.m.
Final Exam: June 9th, noon-1:50 p.m.
Online: via Zoom on Canvas

INSTRUCTOR

Prof. Scott Horowitz
scott.horowitz@du.edu

Instructor Office Hours by appointment:
Online: https://udenver.zoom.us/my/scotthorowitz

TEXTBOOK

Lehninger Principles of Biochemistry, 7th edition, by David L. Nelson and Michael M. Cox. Full and partial versions are available at the bookstore. MacMillan Sapling course is required.

COURSE DESCRIPTION

This course is meant to be an introduction to protein structure and function. It will be primarily active learning. Classroom time will be used primarily for activities, questions, and problem-solving. Reading is required.

COURSE LEARNING OUTCOMES

1. Recognize, describe, and compare protein primary structure, integrating concepts of chemical properties learned in general chemistry.
2. Integrate primary structure with concepts of non-covalent interactions from general chemistry to create interaction principles for building higher order protein structure.
3. Recognize, describe, compare, and build secondary structures using primary structure and non-covalent interactions.
4. Recognize, describe, compare, and build tertiary/quaternary structures using secondary and primary structure, as well as non-covalent interactions.
5. Draw basic chemical mechanisms of enzymes integrating principles from organic chemistry.
6. Describe and draw enzymatic strategies, inhibitors, and kinetics integrating principles from general chemistry and organic chemistry.

COURSE REQUIREMENTS

1. In-class participation (15%)
2. Custom Contest Foldit Puzzles and Assignments (55%)
    - Primary structure (15%)
    - Secondary Structure (10%)
    - Tertiary Structure (10%)
    - Folding Pathway (5%)
    - Immunoglobulin G (5%)
    - Zymogen (5%)
    - COVID-19 (5%)
3. Reading homework (totaling 15%)
4. Cumulative final (with extra Ch. 6) (15%)

LATE WORK/EXAM AND ATTENDANCE POLICY

Late are penalized 10% for each day past the deadline. Except under extraordinary circumstances (e.g. a doctor's note is required for illness), class presentations cannot be made up.

If you are unable to attend class due to a legitimate emergency, please contact me via e-mail. If you are not in class for any other reason, you will be marked absent and earn a zero for the day. Students who arrive more than five minutes late will earn 50% attendance for the day.

DETAILED SCHEDULE

Date	**Subject**	**Reading**	**Due Dates (before class)**
30-Mar	What is biochemistry and this class?		
1-Apr	Non-Covalent Interactions	2.1	
3-Apr	Other things water	2.2-2.4	
6-Apr	Amino acids	3.0-3.1 (skip box 3-1)	
8-Apr	Peptides and Proteins	3.2	Hydrogen bonding puzzle
10-Apr	Continue primary structure puzzle		
13-Apr	Foldit day		
15-Apr	Working with Proteins	3.3 (and box 3-1 from 3.1)	
17-Apr	Primary Structure	3.4	
20-Apr	Primary Structure Puzzle & Quiz		Primary structure puzzle
22-Apr	Overview of Protein Structure	4.0-4.1	
24-Apr	Secondary Structure	4.2	

27-Apr	Continue Secondary Structure Puzzle		Secondary struture puzzle
29-Apr	Tertiary and Quaternary Structure	4.3	
1-May	Folding and Denaturation	4.4	
4-May	Continue tertiary and Foldit pathway puzzles		
6-May	Reversible Binding and Hemoglobin	5.0-5.1 (through "Hemoglobin Subunits are Structurally Similar to Myoglobin, p. 163)	Tertiary structure puzzle, Pathway puzzle
8-May	Cooperativity and Hemoglobin	Rest of 5.1	
11-May	Antibody function & Molecular Motors	5.2 & 5.3	
13-May	Continue IgG puzzle		
15-May	Introduction to Enzymes and starting How they Work	6.0-6.2 through Enzymes affect Reaction Rates, Not Equilibria, p. 192)	IgG puzzle
18-May	How Enzymes Work	Up through 6.2 "Binding Energy Contributes to Reaction Specificity and Catalysis"	
20-May	Enzyme Mechanism- Chymotrypsin	6.2 "Specific Catalytic Groups Contribute to Catalysis through Covalent Catalysis", 6.3 "Enzyme Activity depends on pH" Figure 6-23 (chymotrypsin mechanism)	
22-May	Other Enzyme Mechanisms	6.2 "Specific Catalytic Groups Contribute to	

		Catalysis- Metal Ion Catalysis” 6.4 (enolase and lysozyme, not lactams)	
27-May	Enzyme Kinetics and Mechanism	6.3 (through “Many Enzymes Catalyze Reactions with Two or More Substrates”))	
29-May	Enzyme Inhibition	6.3 (inhibition)	
1-Jun	Allosteric and Phosphorylation Regulation	6.5 (through “Multiple Phosphorylations Allow Exquisite Regulatory Control”	
3-Jun	Zymogens and Complex Regulation	6.5 (remainder)	
5-Jun	COVID-19 puzzle design		Zymogen puzzle
9-Jun	Take home final due		