

Chemistry 365 Fundamentals of Biochemistry Summer 2023

Instructor: Tom Huxford
Department of Chemistry & Biochemistry
Office: CSL 325
Phone: (619) 594-1597 (Lab)
(619) 594-1606 (Office)
(858) 366-5876 (Cell)
e-mail: thuxford@sdsu.edu

Office Hours: Tuesdays 9:00 - 10:00 a.m. PDT and Thursdays 7:00 - 8:00 p.m. PDT
Zoom link: <https://SDSU.zoom.us/j/85982397319>
Call or e-mail if you wish to make an appointment to discuss anything one-on-one with the instructor.

Textbook: Fundamentals of Biochemistry, Fifth Edition
D. Voet, J. Voet & C.W. Pratt (John Wiley & Sons, Inc.)

NOTE: By enrolling in the course, you are automatically assigned to purchase an enhanced eBook version of the text (ISBN: 9781119435006) at a significant discount to the price of the print version of the text. If you prefer to use an alternative method for acquiring the textbook, you must opt out of the optional eBook by 11:59 p.m. on June 2 for a full refund (<https://www.shopaztecs.com/t-equitableaccess.aspx>.)

The course:

Prerequisites-General Chemistry, Organic Chemistry, General Biology

Course description-This is the first in a series of integrated courses in biochemistry, cell, and molecular biology (Chem365, Biol366, Biol366L, Biol567, and Biol567L). Biochemistry is an attempt to describe the complex traits of biological systems in terms of the molecules that make up living things. It is an active area of experimental science. As such, its theories are constantly being reworked and refined as new biological systems are discovered and characterized. The goal of this course is to provide students with the tools to succeed in upper division courses that require an understanding of biomolecules. Furthermore, students with interests in biotechnology, life sciences, and molecular medicine will gain a working vocabulary and understanding of the molecules and fundamental chemical processes that drive these fields.

Expected student learning objectives-

Each student who successfully completes this course will be able to:

- (i) identify the structures and chemical properties of important biomolecules and biopolymers. These include nucleotides and nucleic acids, amino acids and proteins, carbohydrates and polysaccharides, and lipids and membranes;
- (ii) relate molecular structure to biological function;

- (iii) clearly communicate the “central dogma of molecular biology”;
- (iv) quantitatively characterize enzymes (protein catalysts), calculate enzymatic constants, and classify types of enzyme inhibition

Please note-To be successful in this course, you must develop a working familiarity with a vast amount of material. Be prepared to dedicate sufficient time each week to stay current with your reading and studying. You will need to read an average of 40-80 pages of text each week. However, not all of the chapters will be covered in their entirety. Please consult the lecture “Schedule” on pages 3 and 4 of this syllabus to identify chapter pages from which assessment material will be taken. This is not a course for which one can cram the night before an assessment. Neither is this the most complex material with which you will be presented during your science education.

*Online course-*This course is being offered as a fully online course. The course is organized into six modules, the content of each of which is designed to be completed more or less asynchronously, with pre-recorded lectures, homework problem sets, and online assessments (quizzes) that students will be able to access through the Canvas website (<https://canvas.sdsu.edu> Links to an external site.). Students will also have the option of meeting together with the instructor twice weekly via Zoom during scheduled meeting times (Tuesdays 9:00 - 10:00 a.m. PDT and Thursdays 7:00 - 8:00 p.m. PDT) to discuss questions and work together through practice problems. The link to these biweekly Zoom Office Hours is: <https://SDSU.zoom.us/j/85982397319>

*Resources available to students-*The text is the primary resource for this course. Lectures will closely follow the sequence and organization of the textbook. Lectures will be pre-recorded and students will be able to earn up to 5 points per lecture by viewing them, answering embedded questions as they appear, and clicking on "submit quiz" at the end of the lecture. Students can rewatch lectures and resubmit their answers to the embedded lecture questions as many times as they like prior to the due date. Only your highest score will be recorded under “Grades.” The slides used during lecture will also be posted to the Canvas website. A short list of “lecture goals” will be highlighted at the beginning of each lecture. The purpose of outlining the lecture goals is to aid students in studying for online assessments and the cumulative final exam.

It is imperative that students reach out for help as it is needed. This is always true but is a particular challenge with online courses. Students are encouraged to work together in groups and bring their questions to Zoom Office Hours (Tuesdays 9:00 - 10:00 a.m. PDT and Thursdays 7:00 - 8:00 p.m. PDT). Attendance via Zoom during Zoom Office Hours (<https://SDSU.zoom.us/j/85982397319> Links to an external site.) is not mandatory, but affords students with opportunities to discuss the material with their instructor and ask for clarification on problem solving. An active "Discussion Board" will be maintained and a link to it will appear at the beginning of each Canvas Module. Use this Discussion Board to post questions and comments about the course material. The topics that appear in the Discussion Board will serve as jump off points for our Zoom Office Hours. Please be considerate in your online posts (use full sentences, avoid using ALL CAPS, avoid jokes that might be misconstrued, be patient with one another, etc.). You may also directly contact your instructor via e-mail (preferred) or telephone (in case of emergency).

Problem Sets-Each of the six modules contains an associated problem set worth up to 10 points. The purpose of these problem sets is to help students identify areas in which they need to improve their understanding in preparation for assessments and the final exam. It is highly recommended that students attempt these problems, as well as the recommended problems from the end of chapters in the Voet, Voet, and Pratt text, first on their own and then work together in groups and bring their questions to the instructor during Zoom Office Hours. Problem sets are due each Friday, by 6:00 p.m. PDT.

Assessments-Four online assessments are to be completed through Canvas. The assessments will appear at the end of Modules 2, 3, 4, and 5. You may begin assessments any time between 6 a.m. PDT on the Friday they are assigned and 6 a.m. PDT the following Saturday morning. Once you begin, you will have 75 minutes to complete each assessment. You may use your text and notes on the assessments, but they are to be completed individually. Sharing information from assessments with classmates before the 24-hour testing period is over or working together with others on assessments is cheating. Don't cheat.

Final Exam-A cumulative final exam worth 160 points, with approximately 60 points taken from the last two chapters and 100 points from the first ten chapters of the course material, will be available through Canvas on June 30 between 10:00 a.m. – 12:20 p.m. PDT.

The point distribution is as follows:

- Lectures #1-20: 5 points each, **100** points total
- Problem Sets #1-6: 10 points each, **60** points total
- Assessments #1-4 (75 min each): 45 points each, **180** points total.
- Final exam (140 min): **160** points—the final exam is cumulative.

Course grades will be assigned based on total points earned out of 500 points possible. A standard grading curve (90% or above for an A, 80-89.99% is a B, etc.) is expected for this course.

Schedule

Module 1		May 22 – 26	
Mandatory meeting	Monday, May 22, 2023, 10:00 – 11:00 a.m. (Zoom ID: 85982397319)		
Lectures	Introduction		
	Biochemistry is chemistry of life (1)		Ch. 1 (1-11)
	Energy in biological systems (2)		Ch. 1 (11-20)
	Water and noncovalent interactions		Ch. 2 (23-31)
	Acids, bases, and buffers (3)		Ch. 2 (31-39)
Problem Set	1	Due: Friday, May 26 at 6:00 p.m.	
Module 2		May 29 – July 2	
Lectures	Nitrogenous bases, nucleosides, and nucleotides		Ch. 3 (42-45)
	Nucleic acids and the Central Dogma (4)		Ch. 3 (46-53)
	Polymerases and nucleic acid synthesis		Ch. 3 (53-66)
	Recombinant DNA technology (5)		Ch. 3 (66-76)
	Introduction to amino acids video		
Problem Set	2	Due: Friday, June 2 at 6:00 p.m.	
Assessment	June 2	Assessment #1-2	Chapters 1-3 45 points
Module 3		June 5 – 9	
Lectures	Amino acids (6)		Ch. 4 (80-94)
	Protein purification and analysis		Ch. 5 (97-109)
	Evolution of proteins (7)		Ch. 5 (119-126)
	Protein primary and secondary structure (8)		Ch. 6 (131-145)
	Protein tertiary and quaternary structure		Ch. 6 (145-159)
	Protein stability and folding (9)		Ch. 6 (160-176)
Problem Set	3	Due: Friday, June 9 at 6:00 p.m.	
Assessment	June 9	Assessment #3	Chapters 4-6 45 points
Module 4		June 12 – 16	
Lectures	Protein function: Myoglobin and hemoglobin		Ch. 7 (180-200)

	Protein function: Antibodies (10)	Ch. 7 (212-217)
	Monosaccharides (11)	Ch. 8 (221-227)
	Polysaccharides and glycoproteins (12)	Ch. 8 (228-242)
Problem Set	4	Due: Friday, June 16 at 6:00 p.m.
<u>Assessment</u>	<u>June 16</u>	<u>Assessment #4</u> Chapters 7-8 45 points
Module 5		
June 19 – 23		
Lectures	Lipids (13)	Ch. 9 (245-261)
	Membrane proteins	Ch. 9 (262-268)
	Structure of biological membranes (14)	Ch. 9 (269-276)
	Facilitated transport across membranes (15)	Ch. 10 (293-309)
	Active transport across membranes (16)	Ch. 10 (309-318)
Problem Set	5	Due: Friday, June 23 at 6:00 p.m.
<u>Assessment</u>	<u>June 23</u>	<u>Assessment #5</u> Chapters 9-10 45 points
Module 6		
June 26 – 30		
Chapters 11-12		
Lectures	Enzyme catalysis (17)	Ch. 11 (322-339)
	Serine proteases (18)	Ch. 11 (345-357)
	Enzyme kinetics (19)	Ch. 12 (361-372)
	Bisubstrate mechanisms and enzyme inhibition (20)	Ch. 12 (372-382)
Problem Set	6	Due: Friday, June 30 at 11:59 p.m.
Assessment	None	
<u>Final Exam</u>	<u>June 30</u>	<u>10 a.m. – noon PDT</u> Chapters 1-12 160 points