Chemistry 560
General Biochemistry
Spring 2024

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Course time: Tuesdays & Thursdays 11:00 a.m. – 12:15 p.m., LH 439
Attend in person or live online via Zoom link:
https://SDSU.zoom.us/j/83953996289

Zoom Office Hours: Wednesdays 8:00 – 9:00 a.m.; Thursdays 4:00 – 5:00 p.m. (San Diego local time) Zoom link: https://SDSU.zoom.us/j/81778194557

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 permitted access assigned to an enhanced eBook version of the text (ISBN: 9781119435006) through the Equitable Access program. If you prefer to use an alternative method for acquiring your textbooks, then you must opt out of Equitable Access by 11:59 p.m. on January 30 for a full refund (https://www.shopaztecs.com/equitableaccess).

The course:

Prerequisites-General Chemistry, Organic Chemistry, General Biology

Course description-This course serves as a general introduction to the field of biochemistry, as well as the prerequisite for a series of upper level biochemistry elective courses (Chem 562, Chem 563, Chem 564, and Chem 567). 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 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) develop a useful model for functional biological membranes and illustrate their utility with detailed mechanisms of facilitated and active ion transport;
(v) 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 20-40 pages of text each week. However, not all of the chapters will be covered in their entirety. Please consult the lecture "Schedule" at the end of this syllabus to identify chapter pages from which quiz and exam material will be taken. This is not a course for which one can cram the night before an exam. Neither is this the most complex material with which you will be presented during your science education.**

Resources available to students-We will be making extensive use of Canvas (http://canvas.sdsu.edu). There you will find access to your text, which is the primary resource for this course. You will also find the course content organized into "Modules." Live lectures will be held in LH 439 and broadcast live via Zoom (https://SDSU.zoom.us/j/83953996289) during the scheduled class times (Tues. & Thurs. 11:00 a.m. – 12:15 p.m.) and will closely follow the sequence and organization of the text. Lectures will be recorded and links to the lecture video recordings will be uploaded to Canvas as soon as they are available. Powerpoint slides for each lecture will be available for download in the Canvas Modules. A short list of "Lecture goals" will be included at the outset of each lecture. The purpose of outlining these lecture goals is to aid students in studying for quizzes and exams.

It is imperative that students reach out for help as it is needed. Students are encouraged to work together in study groups and to participate in the twice weekly 60 minute "Zoom Office Hours" sessions (Wednesdays 8:00 – 9:00 a.m. and Thursdays 4:00 – 5:00 p.m.) to discuss questions and work through practice problems. The link to these twice weekly Zoom Office Hours is: https://SDSU.zoom.us/j/81778194557. This is an opportunity to ask questions directly of your instructor and receive immediate feedback. There is also a "Discussions" section on Canvas to which students and their instructor can post questions and engage in discussions about topics pertaining to the course material. Please be considerate in your 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 seven modules contains an associated problem set. Work together with your classmates and your instructor to complete these problems, which have been designed

to illustrate important points pertaining to the class material. Problem sets are due via document upload to Canvas at 11:59 p.m. (San Diego local time) on the date indicated on in this syllabus. It is highly recommended that students attempt these problems, as well as the problems at the end of chapters in the Voet, Voet & Pratt text, and bring their questions for discussion during live Zoom Office Hours. Each of the seven problem sets is worth up to 10 points and an additional 10 point bonus will be given to students who turn in all seven of their problem sets on time.

Quizzes-There are four scheduled quizzes (see "Schedule" at the end of this syllabus) worth up to 30 points each. Quizzes will be administered and completed in person during the final 20 minutes of lecture on the scheduled dates. Students will need a pencil, an eraser, and a non-programmable calculator to complete their quizzes

Mid-term Exams-There are two scheduled mid-term exams worth up to 100 points each that will be held in person during classroom time on the dates scheduled (see "Schedule" at the end of this syllabus). Students will need a pencil, an eraser, and a non-programmable calculator to complete their mid-term exams.

Final Exam-A cumulative final exam worth up to 140 points, with approximately 60 points taken from the last two chapters and 80 points from the first ten chapters of the course material, will be held in LH 439 on May 9, 2024 between 10:30 a.m. – 12:30 p.m.

The point distribution is as follows:

- Problem Sets #1-7: 10 points each + 10 points for completing all 7 on time, **80** points total
- Quizzes #1-4 (60 min each) 30 points each, **120** points total.
- Mid-term Exams #1 and 2 (75 min each) 100 points each, **200** points total.
- Final exam (120 min) **140** points – the final exam is cumulative.

Course grades will be assigned based on total points earned out of 540 points possible.

Schedule

Module 1

Lectures			Reading
Jan.	18	Introduction (0)	
	23	Biochemistry is chemistry of life (1)	Ch. 1 (1-11)
	25	Energy in biological systems (2)	Ch. 1 (11-20)
	30	Water and noncovalent interactions (3)	Ch. 2 (23-31)
Feb.	1	Acids, bases, and buffers (4)	Ch. 2 (31-39)

Problem Set 1 10 points **Due: Sunday, Feb. 4 at 11:59 pm**

Quiz **Feb. 6** (in class) **Quiz 1** Chapters 1-2 30 points

Module 2

Lectures			Reading
Feb.	**6***	Nitrogenous bases, nucleosides, and nucleotides (5)	Ch. 3 (42-45)
	8	Nucleic acids and the Central Dogma (6)	Ch. 3 (46-53)
	13	Polymerases and nucleic acid synthesis (7)	Ch. 3 (53-66)
	15	Recombinant DNA technology (8)	Ch. 3 (66-76)

Problem Set 2 10 points **Due: Sunday, Feb. 18 at 11:59 pm**

Quiz **Feb. 20** (in class) **Quiz 2** Chapter 3 30 points

Module 3

Lectures			Reading
Feb.	**20***	Amino acid structure, properties, and naming (9)	Ch. 4 (80-88)
	22	Amino acid stereochemistry and derivatives (10)	Ch. 4 (88-94)
	27	Protein purification and analysis (11)	Ch. 5 (97-109)
	29	Protein sequencing and evolution of proteins (12)	Ch. 5 (110-126)

Problem Set 3 10 points **Due: Sunday, Mar. 3 at 11:59 pm**

Mar. 5 Mid-term Exam 1 (Chapters 1-5) 100 points In Class

Module 4

Lectures			Reading
Mar.	7	Protein primary and secondary structure (13)	Ch. 6 (131-145)
	12	Protein tertiary and quaternary structure (14)	Ch. 6 (145-159)
	14	Protein stability and folding (15)	Ch. 6 (160-176)
	19	Protein function: Myoglobin and hemoglobin (16)	Ch. 7 (180-200)
Mar.	**21***	Protein function: Antibodies (17)	Ch. 7 (212-217)

Problem Set 4 10 points **Due: Sunday, Mar. 24 at 11:59 pm**

Quiz **Mar. 21** (in class) **Quiz 3** Chapters 6-7 30 points

Module 5

Lectures			Reading
Mar.	26	Monosaccharides (18)	Ch. 8 (221-227)
	28	Polysaccharides and glycoproteins (19)	Ch. 8 (228-242)

Problem Set 5 10 points **Due: Sunday, Apr. 7 at 11:59 pm**

Apr. 1 – Apr. 5 No Class – Spring Break

Apr.	9	Lipids (20)	Ch. 9 (245-261)
Apr.	**11***	Membrane proteins and biological membranes (21)	Ch. 9 (262-276)

Quiz **Apr. 11** (in class) **Quiz 4** Chapters 8-9 30 points

Module 6

Lectures			Reading
Apr.	16	Facilitated transport across membranes (22)	Ch. 10 (293-309)
	18	Active transport across membranes (23)	Ch. 10 (309-318)

Problem Set 6 10 points **Due: Sunday, Apr. 21 at 11:59 pm**

Apr. 23 Mid-term Exam 2 (Chapters 6-10) 100 points In Class

Module 7

Lectures			Reading
Apr.	25	Enzyme catalysis (24)	Ch. 11 (322-339)
	30	Serine proteases (25)	Ch. 11 (345-357)
May	2	Enzyme kinetics (26)	Ch. 12 (361-372)

Problem Set 7 10 points **Due: Sunday, May. 5 at 11:59 pm**

May. 9 Final Exam (Chapters 1-12) 140 points In Class 10:30 a.m. – 12:30 p.m.

***In class quiz on these four dates!**