Chemistry 560

General Biochemistry

Fall 2017
Schedule Number 20833

Class Days: Tuesdays & Thursdays
Class Times: 11 am – 12:15 pm
Class Location: ARTN 412

Office Hours: Tuesdays & Thursdays 2-3 pm (except 9/5, 9/7, 10/5, 10/24, 10/26, 11/2, 12/7/2017), Fridays 11 am- 1pm, or email me to make an appointment, mswairjo@mail.sdsu.edu.

Office Hour Location: My office CSL-340

INSTRUCTOR INFORMATION

Manal A. Swairjo, Ph.D.
Associate Professor
Department of Chemistry and Biochemistry
San Diego State University
5500 Campanile Dr
San Diego, CA 92182
Office Tel: (619) 594-6801
Email: mswairjo@mail.sdsu.edu
Web: http://www.chemistry.sdsu.edu/faculty/index.php?name=Swairjo
Office location: Chemical Sciences Laboratory (CSL), room 340 (SDSU map coordinates K3).

Course Overview

Course Description: Biochemistry is an experimental science that brings together biology and chemistry. In one facet of the field, Biochemistry explores the natural chemical processes within living organisms. In another facet, it is the science of using chemical knowledge and techniques to understand and solve biological problems. This course is an upper-level undergraduate course intended to introduce students of chemistry to the basic concepts required for advanced study in biochemistry including the molecular makeup of life, enzymes, signal transduction, metabolism and molecular biology. Biochemistry is an enormous and still rapidly growing field and its study requires two semesters. Therefore, while this course offers a substantial survey of biochemistry, it will emphasize learning of core facts and provide advanced learning skills and resources for continued study. Furthermore, students with interests in biotechnology, life sciences, pharmacology, and molecular medicine will gain a working vocabulary and understanding of the biomolecules that drive these fields.

- **Course structure:** This one semester course will be delivered over 16 weeks; 13.5 weeks of instruction, 1.5 weeks of assessment, half a week of review, and half a week of break. The course is structured in three learning modules, separated by 2 assessments and followed by a final exam (**see course schedule below**). Class meets twice a week for 1 hour and 15 minutes. The course includes 11 homework assignments due on set dates (see course schedule below). The assessments (exams) consist of problems probing critical thinking, depth of knowledge, and application skills. The homework assignments are in themselves learning opportunities designed for a variety of learning styles and will include conceptual problem solving activities, building illustrative models, experimental design, interpretation of experimental data, fact finding, and memory drills.

- **Student Learning Outcomes:**

  Upon completing this course, students should be able to

1) compare the structures of a prokaryotic and a eukaryotic cell.
2) match the structures with the chemical properties of important biomolecules. These include nucleotides and nucleic acids; amino acids and proteins, carbohydrates and polysaccharides, and lipids and membranes.
3) dissect the processes of DNA replication, DNA transcription and protein translation.
4) match the molecules of gene expression with their biochemical functions.
5) classify protein structural hierarchy and illustrate how it relates to protein function.
6) write an accurate description of the three dimensional structure of a protein.
7) illustrate the structure of biological membranes.
8) describe the principles that govern membrane structure and function.
9) quantitatively characterize enzymes (protein catalysts), calculate enzymatic constants, and classify mechanisms of enzyme regulation.
10) interpret enzyme kinetic data.
11) describe the biochemical basis of at least 5 human diseases.

- **Real Life Relevance:**

  This course is designed to entice students of biochemistry to pursue deep study in the field. It gives a looking glass view of the chemical and molecular underpinnings of Biology, placed in the context of evolution, human health and disease, and ecology. Students see how it is that understanding nature and advancing medicine is impossible without in-depth biochemical knowledge. Therefore, a major outcome of the course is the promotion of interest in the work of biochemists and a curiosity toward modern research approaches in molecular medicine and biotechnology.

Enrollment Information

Prerequisites:

General chemistry, organic chemistry, physical chemistry
(Chemistry 232, 232L, and credit or concurrent registration in Chemistry 410A, 432, 432L).

Dropping class:

You can drop the class within the first 10 days of the semester (university policy).

Course Materials

Required Materials:
- **Fundamentals of Biochemistry, Fourth or Fifth Edition**
  D. Voet, J. Voet & C.W. Pratt (John Wiley & Sons, Inc.).
- Laptop with internet connection.
- **SDSU Blackboard account.**
- Access to **Sapling online homework** and study module. See "Assignment instructions" below.
- Three SCANTRONS F-289-PAR-L (red long type). They can be purchased from the SDSU bookstore.

HOW TO ACCESS THE eBOOK:

Immediate access to the required textbook (Voet: Fundamentals of Biochemistry 5th, ISBN 9781118918401) & Sapling (Sapling Learning Single Course Access, 9781319080518) are provided in a 180-day subscription digital format by the first day of classes and are free through Sept 11th at 11:59PM. After Sept 11th, your SDSU student account will be charged a special reduced price of $92.00 for access to the content in Blackboard for the remainder of the Fall semester unless you opt-out of the content by 11:59 PM on Sept 11th.

To access your eBook, click the RedShelf link in Blackboard, then the green View Course Materials button and Start Reading. Note: avoid FireFox and Safari web browsers. Google Chrome and Internet Explorer work.

To opt out visit: www.shopaztecs.com/optout .

For more information visit: www.shopaztecs.com/immediateaccess .

Additionally, after the opt-out period ends and if you remain in the program, a reduced price print add-on will be available for $49.99 if you prefer print. For those opting out, you will need to procure digital and/or print materials at regular pricing through the bookstore or elsewhere.

If you have problems/questions or if you have accidentally opted out, email optout@aztecmail.com

ADDITIONAL RESOURCES: I will be posting all lecture PowerPoints on Blackboard. Check there weekly. The lectures will introduce additional online resources for certain topics.

HOW TO STUDY: Your textbook and lecture PowerPoints are the two major resources for this course. Use the lecture PowerPoints as your study guide, by following the specific learning objectives listed at the beginning of each lecture. Guided by this list, read the pertinent sections in the book chapter for that lecture.

Course Structure and Mode of Delivery

- Course structure: This one semester course will be delivered over 16 weeks; 13.5 weeks of instruction, 1.5 weeks of assessment, half a week of review, and half a week break. The course is structured in three learning modules, separated by 2 assessments and followed by a final exam (**see course schedule below**). Class meets twice a week for 1 hour and 15 minutes. The mode of delivery includes lecture, in-class problem-based assignments, guided online applications, videos.

- Technology Utilized in the Course: Blackboard with eBook link RedShelf, PowerPoint, Sapling homework student website.

Course Assessment and Grading

Scoring:

11 Homework assignments: 5 points each, total 55 points.

2 Midterm exams: 12.5 points each, total 25 points.

Final exam: 20 points.

TOTAL POINTS: 100

Score	Grade
≥ 93.33	A
90 to < 93.33	A-
86.66 to < 90	B+
83.33 to < 86.66	B
80 to < 83.33	B-
76.66 to < 80	C+
73.33 to < 76.66	C
70 to < 73.33	C-
66.66 to < 70	D+
60 to < 66.66	D

Grade Point Conversion Chart		
A = 4.0	C + = 2.3	D - = 0.7
A - = 3.7	C = 2.0	F = 0
B + = 3.3	C - = 1.7	WU = 0
B = 3.0	D + = 1.3	I = 0
B - = 2.7	D = 1.0	IC = 0

< 60	F

Grading scale:

SAPLING HOMEWORK:
We will be making use of an online homework/study module prepared specifically for this course by Sapling Learning. All students are required to purchase access to the online homework server.

Go to your Blackboard account. Under "Assignments" you will find a single-sign-on link to Sapling. For instructions on how to enroll in Sapling using this link, go here https://community.macmillan.com/docs/DOC-6225-sapling-learning-student-single-sign-on.

If you have any issues using Sapling throughout the course, send an email explaining the issue to support@saplinglearning.com to get help.

There will be 11 homework assignments, each pertaining to content covered in the two classes of a given week. Some homework will be in the form of a Sapling assignment and some may be in the form of a case study posted directly on Blackboard. All homework assignments are given on a Tuesday and are due by 11 am on the following Tuesday. For case studies (if any), submit your work under the assignment feature on Blackboard.

Modules and Estimated Hours

Module	Estimated hours
How is energy conserved and used by the cell? How is genetic information stored, transmitted, expressed, and experimentally gathered?	14
The structures and functions of proteins.	10.5
Membrane structure and function. Enzymes.	13.5

Guidelines for student participation

1) Do not miss class. Some homework assignments may require working in groups. If you miss class, you run the risk of disconnecting from your group.
2) Be ready to read 20-30 pages a week. Do your work weekly on time. This is not a course for cramming at the last minute.
3) All homework assignments are given on a Tuesday and are due by 11 am on the following Tuesday, except for the first homework (Homework 1) which is due in 2 weeks to give you more time to learn how to use Sapling. See course schedule below.

Course Schedule (note: the chapter pages indicated are from the 5th edition of the text, eBook version. If using the 4th edition, the pages are near these numbers.

Date	Activity (lectures are numbered)	Reading chapter (pages)	Assignment given out that day
Tues, Aug 29	1) *Understanding the course syllabus and homework system.* Lecture: Introduction to the Chemistry of Life.	Syllabus & Ch. 1 (pp. 1-10)	Homework 1, due 9/12 at 11 am
Thurs, Aug 31	2) Lecture: Energy in biological systems.	Ch. 1 (11-21)	
Tues, Sept 5	No class		
Thurs, Sept 7	No class		

Date	Activity (lectures are numbered)	Reading chapter (pages)	Assignment given out that day
Tues, Sept 12	3) Water, acids, bases and buffers.	Ch. 2 (24-38)	Homework 2, due 9/19 at 11 am
Thurs, Sept 14	4) Lecture: Nitrogenous bases, nucleosides, and nucleotides.	Ch. 3 (42-45)	
Tues, Sept 19	5) Lecture: Nucleic acids and the Central Dogma.	Ch. 3 (46-53)	Homework 3, due 9/26 at 11 am
Thurs, Sept 21	6) Lecture: Polymerases and nucleic acid synthesis.	Ch. 3 (54-66)	
Tues, Sept 26	7) Lecture: Recombinant DNA technology.	Ch. 3 (66-77)	
Thurs, Sept 28	**Exam 1** (in material covered in Lectures 1-7).		
Tues, Oct 3	8) Lecture: Amino Acids and proteins.	Ch. 4 (80-95)	Homework 4, due 10/10 at 11 am
Thurs, Oct 5	9) Lecture: Protein primary structure. Protein purification and analysis.	Ch. 5 (97-109)	
Tues, Oct 10	10) Lecture: Protein sequencing. Protein secondary structure.	Ch. 6 (110-135)	Homework 5, due 10/17 at 11 am
Thurs, Oct 12	11) Lecture: Protein tertiary structure.	Ch. 6 (146-159)	
Tues, Oct 17	12) Quaternary structure. Protein stability and folding.	Ch. 6 (159-169)	Homework 6, due 10/24 at 11 am
Thurs, Oct 19	13) Lecture: Protein function, chaperones, myoglobin and hemoglobin, hemoglobin disease.	Ch. 7 (170-177) Ch. 7 (180-201)	
Tues, Oct 24 (Dr. Luthra)	14) Lecture: Protein function, Antibodies.	Ch. 7 (212-216)	
Thurs, Oct 26 (Dr. Luthra)	**Exam 2** (in material covered in Lectures 8-14).		
Tues, Oct 31	15) Lecture: Monosaccharides.	Ch. 8 (217-228)	Homework 7, due 11/7 at 11 am

Date	Activity (lectures are numbered)	Reading chapter (pages)	Assignment given out that day
Thurs, Nov 2	16) Polysaccharides and glycoproteins.	Ch.8 (229-243)	
Tues, Nov 7	17) Lecture: Lipids.	Ch. 9 (244-259)	Homework 8, due 11/16 at 11 am
Thurs, Nov 9	18) Lecture: Lipid bilayers and membrane proteins.	Ch. 9 (255-269)	
Tues, Nov 14	19) Lecture: Biological membranes 1.	Ch. 9 (270-277)	Homework 9, due 11/21 at 11 am
Thurs, Nov 16	20) Lecture: Biological membranes 2.	Ch. 9 (277-290)	
Tues, Nov 21	21) Lecture: Facilitated transport across membranes.	Ch. 10 (291-310)	
Thurs, Nov 23	Thanksgiving holiday. No class		
Tues, Nov 28	22) Lecture: Active transport across membranes.	Ch. 10 (310-319)	Homework 10, due 12/5 at 11 am
Thurs, Nov 30	23) Lecture: Enzyme catalysis.	Ch. 11 (322-329)	
Tues, Dec 5	24) Lecture: Enzyme catalytic mechanisms: Serine proteases.	Ch. 11 (330-339) (339-355)	Homework 11, due 12/12 at 11 am
Thurs, Dec 7	25) Lecture: Enzyme kinetics.	Ch. 12 (361-373)	
Tues, Dec 12	26) Lecture: Enzyme inhibition and structure based design.	Ch. 12 (373-383)	
Thurs, Dec 14 LAST CLASS	27) Catch up review.		
Week of Dec 18-22. Exact date and time TBD.	**Final exam** (in material covered in Lectures 15-26).		

Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as

possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Academic Honesty

The University adheres to a strict policy regarding cheating and plagiarism. These activities will not be tolerated in this class. Become familiar with the policy (http://www.sa.sdsu.edu/srr/conduct1.html). Any cheating or plagiarism will result in failing this class and a disciplinary review by Student Affairs.

Examples of Plagiarism include but are not limited to:
- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work)
- Copying and pasting work from an online or offline source directly and calling it your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
- Submitting a piece of work you did for one class to another class.

If you have questions on what is plagiarism, please consult the policy (http://www.sa.sdsu.edu/srr/conduct1.html) and this helpful guide from the Library:(http://infodome.sdsu.edu/infolit/exploratorium/Standard_5/plagiarism.pdf)

Turnitin

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. You may submit your papers in such a way that no identifying information about you is included. Another option is that you may request, in writing, that your papers not be submitted to Turnitin.com. However, if you choose this option you will be required to provide documentation to substantiate that the papers are your original work and do not include any plagiarized material.