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# GENERAL BIOCHEMISTRY– CHEM 560

SPRING 2020  
SCHEDULE NUMBER 20764

## COURSE INFORMATION

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Class Days: TTh Jan 23 – May 7, 2020

Class Times: 11:00 am – 12:15 pm

Class Location: EBA-439

Mode of Delivery: Lecture

Instructor: Manal Swairjo, PhD.

Office Hours Times: TTh 1:30-2:30 pm, or email for appointment mswairjo@sdsu.edu

Office Hours Location: CSL 340 (K3 on SDSU map)

## COURSE OVERVIEW

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### 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 solve biological problems. This course is intended to introduce students of chemistry to the molecular makeup of life. While it offers a substantial survey of biochemistry, the course emphasizes learning of core facts and provides 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.

### Real Life Relevance:

This course is an entry way to understanding modern medicine and biotechnology, and is essential for any career in these fields, including job placements in the biotechnology industry and health professions.

### Relation to Other Courses:

This course lays the foundation for concepts covered in CHEM 562, CHEM 563a/b, CHEM 564 and CHEM 567.

### Student Learning Outcomes:

<b>Student learning outcome</b>	<b>Course activity</b>	<b>Assessment</b>
Match the chemical compositions and structures of important biomolecules with their chemical and physical properties and biological functions. These include nucleotides and nucleic acids; amino acids and proteins, carbohydrates and polysaccharides, lipids and membranes.	Read assigned textbook material, guided by instructor Powerpoints. Homework assignments.	In midterm exams, students will be asked to identify biomolecules from their structures and match them to biological function and chemical properties.
Describe and illustrate the biomolecules and biochemical processes that govern the flow of genetic information in living organisms, methods for isolation and analysis of DNA and proteins, and acquisition and utility of genomic information.	Read assigned textbook material, guided by instructor Powerpoints. Homework assignments.	In midterm exam, students will be asked to define named biochemical processes underlying gene expression, and identify appropriate methods for isolation and analysis of relevant biomolecules.
Illustrate the structure of biological membranes and describe the principles that govern membrane structure and function. Describe select examples of membrane proteins.	Read assigned textbook material, guided by instructor Powerpoints. Homework assignments.	In midterm exam, students will be asked to illustrate various biological membranes and identify their protein, lipid and carbohydrate components. In homework assignment, students will display and analyze structures of membrane proteins and answer relevant questions.
Describe the kinetic behavior of enzymes, and their catalytic, regulatory and inhibition mechanisms. List select examples.	Read assigned textbook material, guided by instructor Powerpoints. Homework assignments.	In midterm exam, students will be asked to annotate structural and functional components of enzyme active sites, interpret kinetic data and inhibition plots, and identify cofactors of select enzymatic reactions.
Describe the molecular basis of at least 5 human diseases.	Read assigned textbook material, guided by instructor Powerpoints. Homework assignments.	In midterm exams, students will be asked to match several human diseases with their underlying biomolecules or chemical basis.

## ENROLLMENT INFORMATION

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### Prerequisites:

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

- Adding/Dropping Procedures:

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

## COURSE MATERIALS

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### Required Materials:

- Textbook: Voet, Voet, and Pratt: “**Fundamentals of Biochemistry**”, 5<sup>th</sup> Edition, Wiley, 2016. ISBN 978-1118918432. This textbook will be used in CHEM 562, 563 and 564. Therefore, acquiring it now is a must for biochemistry majors.
- Laptop with internet connection, access to SDSU Blackboard, Access to Sapling online homework and study module. See “Assignment instructions” below.
- **Immediate Access Course: Some or all of the required course materials for this class are provided in a digital format by the first day of classes and are free through the add/drop date. Your SDSU student account will then be charged a special reduced price for use of the materials for the remainder of the semester unless you opt-out of the content by 11:59 PM on the add/drop date. Please visit [www.shopaztecs.com/immediateaccess](http://www.shopaztecs.com/immediateaccess) for additional information about Immediate Access pricing, digital subscription duration, print add-ons, opting out and other frequently asked questions.**

### Recommended Materials and how to study:

Lecture Powerpoints will be posted on Blackboard and will serve as a study guide.

**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.**

## TECHNICAL SUPPORT FOR BLACKBOARD

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Student support for Blackboard is provided by the Library Computing Hub, located on the 2<sup>nd</sup> floor of Love Library. They can be reached at 619-594-3189 or [hub@mail.sdsu.edu](mailto:hub@mail.sdsu.edu)

## COURSE STRUCTURE AND CONDUCT

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### Technology Utilized in the Course:

Blackboard, Sapling homework student website, Pymol software (free student version, Schrodinger). All students must download and install this free software on their laptops. It is needed for some homework assignments. Download the student version <https://pymol.org/edu/?q=educational/>

### Expectations:

- **This is a rich course. Plan on reading 20-30 pages a week on average, plus the powerpoint. It is not the kind of course that one can cram the week before the exam. Attendance of lecture is required. It is the best way to learn what to focus on in your weekly study, and will therefore save you time and spare you a lot of stress.**
- **All homework assignments are given on a Friday and are due by midnight on the following Friday, 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 ASSESSMENT AND GRADING

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10 Homework assignments: 5 points each, total 50 points.

2 Midterm exams: 15 points each.

Noncumulative final exam: 20 points.

**TOTAL POINTS: 100**

### Grading scale:

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
< 60	F

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

## EXCUSED ABSENCE MAKE-UP POLICIES:

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You are required to take the final exam on the university-scheduled date. No make-up final exam will be offered.

## ACADEMIC HONESTY

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The University adheres to a strict [policy regarding cheating and plagiarism](http://studentaffairs.sdsu.edu/srr/cheating-plagiarism.html). These activities will not be tolerated in this class. Become familiar with the policy and what constitutes plagiarism (<http://studentaffairs.sdsu.edu/srr/cheating-plagiarism.html>). Any cheating or plagiarism will result in failing this class and a disciplinary review by the University. These actions may lead to probation, suspension, or expulsion.

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

For more information on plagiarism, consult the SDSU policy (<http://www.sa.sdsu.edu/srr/conduct1.html>).

## TURNITIN

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Students agree that by taking this course all required papers may be subject to submission for textual similarity review to [Turnitin.com](https://www.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 [www.turnitin.com](https://www.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.

## Resources for students

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A complete list of all academic support services--including the [Writing Center](#) and [Math Learning Center](#)--is available on the Student Affairs' [Academic Success](#) website. [Counseling and Psychological Services](#) (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at [http://go.sdsu.edu/student\\_affairs/cps/therapist-consultation.aspx](http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx) between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

## CLASSROOM CONDUCT STANDARDS

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SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:

- Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- Conduct that threatens or endangers the health or safety of any person within or related to the University community, including
  1. physical abuse, threats, intimidation, or harassment.
  2. sexual misconduct.

Violation of these standards will result in referral to appropriate campus authorities.

## MEDICAL-RELATED ABSENCES

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Students are instructed to contact their professor/instructor/coach in the event they need to miss class, etc. due to an illness, injury or emergency. All decisions about the impact of an absence, as well as any arrangements for making up work, rest with the instructors. [Student Health Services](#) (SHS) does not provide medical excuses for short-term absences due to illness or injury. When a medical-related absence persists beyond five days, SHS will work with students to provide appropriate documentation. When a student is hospitalized or has a serious, ongoing illness or injury, SHS will, at the student's request and with the student's consent, communicate with the student's instructors via the Vice President for Student Affairs and may communicate with the student's Assistant Dean and/or the [Student Ability Success Center](#).

## SDSU ECONOMIC CRISIS RESPONSE TEAM

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If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit [sdsu.edu/ecrt](https://sdsu.edu/ecrt), email [ecrt@sdsu.edu](mailto:ecrt@sdsu.edu), or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.

## STUDENTS WITH DISABILITIES

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If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Student Abilities Success Center at (619) 594-6473. You can also learn more about the services provided by visiting the [Student Abilities Success Center](#) website.

To avoid any delay in the receipt of your accommodations, you should contact Student Abilities Success Center 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 Abilities Success Center. Your cooperation is appreciated.

## Student Privacy and Intellectual Property

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The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will use Blackboard to communicate with you, and I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

## Religious observances

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According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

## COPYRIGHT POLICY

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SDSU respects the intellectual property of others and we ask our faculty & students to do the same.

It is best to assume that any material (e.g., graphic, html coding, text, video, or sound) on the Web is copyrighted unless specific permission is given to copy it under a [Creative Commons License](#). More information about the use of copy written material in education as part of the [TEACH Act](#) and [Copyright Fair Use Guidelines](#). Whenever possible, you should attribute the original author of any work used under these provisions.

## COURSE SCHEDULE

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<b>Date</b>	<b>Activity (lectures are numbered)</b>	<b>Reading chapter (pages)</b>	<b>Assignment due Friday that week</b>
Thurs, 1/23	<i>course syllabus and homework system.</i>	Syllabus	
Tues, 1/28	1) Lecture: Introduction to the Chemistry of Life.	Ch. 1 (pp. 1-10)	Homework 1
Thurs, 1/30	2) Lecture: Energy in biological systems.	Ch. 1 (11-21)	
Tues, 2/4	3) Water, acids, bases and buffers.	Ch. 2 (24-38)	Homework 2

<b>Date</b>	<b>Activity (lectures are numbered)</b>	<b>Reading chapter (pages)</b>	<b>Assignment due Friday that week</b>
Thurs, 2/6	4) Lecture: Nitrogenous bases, nucleosides, and nucleotides.	Ch. 3 (42-45)	
Tues, 2/11	5) Lecture: Nucleic acids and the Central Dogma.	Ch. 3 (46-53)	Homework 3
Thurs, 2/13	6) Lecture: Polymerases and nucleic acid synthesis.	Ch. 3 (54-66)	
Tues, 2/18	7) Lecture: Recombinant DNA technology.	Ch. 3 (66-77)	
Thurs, 2/20	<b>Exam 1</b> (in material covered in Lectures 1-7).		
Tues, 2/25	8) Lecture: Amino Acids and proteins.	Ch. 4 (80-95)	Homework 4
Thurs, 2/27	9) Lecture: Protein primary structure. Protein purification and analysis.	Ch. 5 (97-109)	
Tues, 3/3	10) Lecture: Protein sequencing. Protein secondary structure.	Ch. 6 (110-135)	Homework 5
Thurs, 3/5	11) Lecture: Protein tertiary structure.	Ch. 6 (146-159)	
Tues, 3/10	12) Protein quaternary structure. Protein stability and folding.	Ch. 6 (159-169)	Homework 6
Thurs, 3/12	13) Lecture: Protein function, chaperones, myoglobin and hemoglobin, hemoglobin disease.	Ch. 7 (170-177) Ch. 7 (180-201)	
Tues, 3/17	14) Lecture: Protein function, Antibodies.	Ch. 7 (212-216)	
Thurs, 3/19	<b>Exam 2</b> (in material covered in Lectures 8-14).		
Tues, 3/24	15) Lecture: Monosaccharides.	Ch. 8 (217-228)	Homework 7
Thurs, 3/26	16) Lecture: Polysaccharides and glycoproteins.	Ch.8 (229-243)	
Tues, 4/7	17) Lecture: Lipids.	Ch. 9 (244-259)	Homework 8
Thurs, 4/9	18) Lecture: Lipid bilayers and membrane proteins.	Ch. 9 (255-269)	
Tues, 4/14	19) Lecture: Biological membranes 1.	Ch. 9 (270-277)	Homework 9
Thurs, 4/16	20) Lecture: Biological membranes 2.	Ch. 9 (277-290)	

Date	Activity (lectures are numbered)	Reading chapter (pages)	Assignment due Friday that week
Tues, 4/21	21) Lecture: Facilitated transport across membranes.	Ch. 10 (291-310)	
Thurs, 4/23	22) Lecture: Active transport across membranes.	Ch. 10 (310-319)	Homework 10
Tues, 4/28	23) Lecture: Enzyme catalysis.	Ch. 11 (322-329)	
Thurs, 4/30	24) Lecture: Enzyme catalytic mechanisms: Serine proteases.	Ch. 11 (330-339) (339-355)	
Tues, 5/5	25) Lecture: Enzyme kinetics.	Ch. 12 (361-373)	
Thurs, 5/7	26) Lecture: Enzyme inhibition and structure based drug design.	Ch. 12 (373-383)	
Tues, 5/12	<b>Exam 3</b> (in material covered in Lectures 15-26).		

### ESTIMATED TIME COMMITMENT

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