

BIBC 100-Structural Biochemistry

Spring 2024

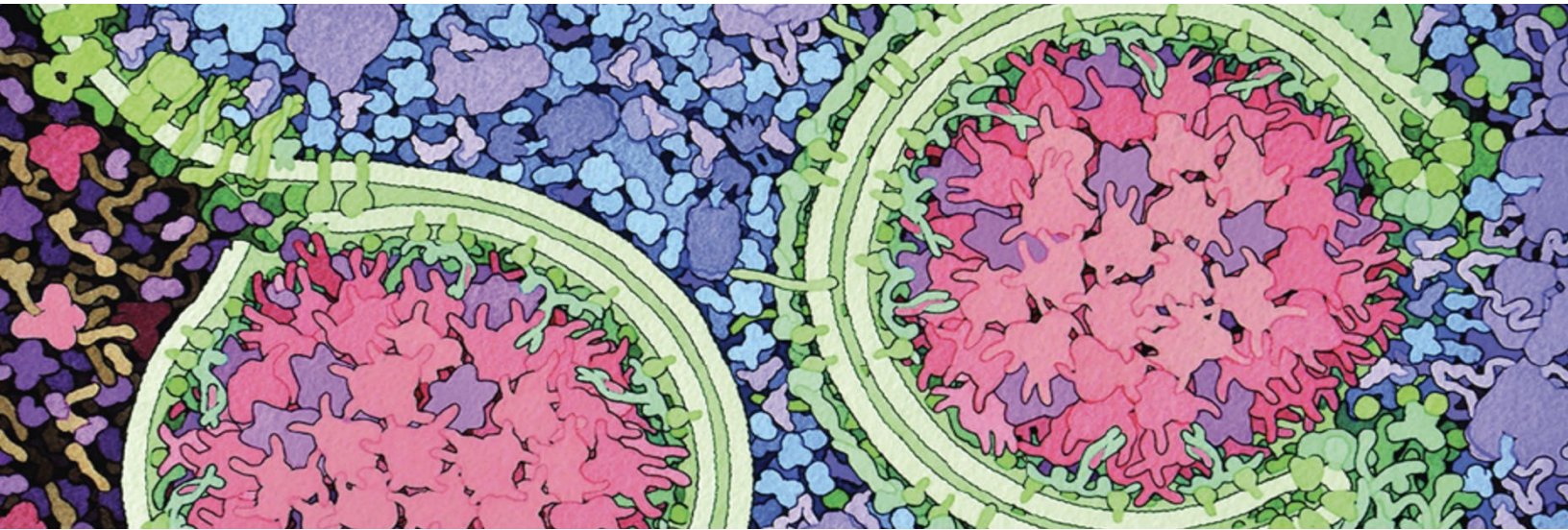
Lecture Time: in person most days & zoom all days, in 2622 York Hall, MWF 8:00 am-8:50 am

Instructor: Rommie Amaro

Email: ramaro@ucsd.edu

Office Hours: Fridays 1-2 pm

Course Website: <https://canvas.ucsd.edu/courses/54426>



Welcome!

I am looking forward to being your instructor for this quarter and my main goal is to teach you the course material and fairly test your knowledge of this material.

Instructor communication policy: I am available to meet with you during in-person lectures, office hours, or by email. If you have questions, I encourage you to attend office hours as it's easier to explain concepts in person. Due to volume, mail replies will be limited to 1-2 sentences in most cases. For emergencies, please contact me via email by writing BIBC100 as the subject and if I do not respond within 24 hours, please send me a reminder email. I will do my best to be responsive on the weekends, but I am human taking care of four kids and need down time too. Let's make this a great quarter!



Course Description

Biochemistry involves the study of the molecular composition of living cells, the organization of biological molecules within the cell, and the structure and function of these biological molecules. The biological macromolecules which this course focuses on are proteins, polysaccharides, and polynucleic acids (DNA and RNA), including the monomeric units of these macromolecules. We will concentrate on the structures of these molecules, their functions, and the strong relationship between structure and function. We will also examine the structure and function of lipids, a fourth important type of biological molecule and a major component of cell membranes. Along with the study of lipids, we will examine biological transport in membranes. Other topics to be examined in the course include the kinetics and catalytic mechanisms of enzymes. Methods and approaches used in biochemical research will be presented as will the biochemical basis of some disease states.

Student Learning Outcomes:

By the successful completion of this course, you will be able to understand:

- basic cellular structure
- the special properties of water and how the aqueous environment influences the behavior of biological macromolecules
- the structures of amino acids, their chemical properties and their organization into polypeptides and proteins.
- methods for isolating and characterizing proteins
- the basic elements of protein structure
- key principles of protein function.
- enzymes and how they catalyze reactions as well as enzyme kinetics
- structure of fundamental monosaccharides and polysaccharides structure and basic function of nucleotides
- structure of different classes of lipids and their roles in biological systems

Course Objectives:

Through problem sets, exams, and quizzes, students will demonstrate the ability to engage in scientific as well as quantitative and qualitative reasoning.

Course Format:

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- **Lectures:** Lectures will be held in person (most days) and by zoom (always), and will be recorded via UCSD's videocast system. **Although attendance to lecture is NOT mandatory, it is highly encouraged that you attend.** During lectures, to gauge student's understanding of the lecture, I will periodically ask for questions.
 - **7 lectures will be ZOOM ONLY:** Due to an unavoidable scheduling conflict, our first four lectures of the term (April 1, 3, 5, 8) as well as one week in May (May 6, 8, 10) will be offered ONLY BY ZOOM. All other sessions will be held in-person (but also live broadcast by zoom) in the scheduled lecture hall. The ZOOM-ONLY days are listed in the schedule, marked with ZOOM after the day.

Course Materials and Tools:

- Textbooks listed below are optional. Exams and quizzes will be based on materials covered in class and discussion sections.
 - **Lehninger Principles of Biochemistry** (Nelson and Cox)
 - **Introduction to Protein Structure** (Branden and Tooze)
 - **Fundamentals of Biochemistry: Life at the Molecular Level** (Voet, Voet, & Pratt)
- Technology Requirement and Support
 - A computer equipped with video and mic.
 - Access to the internet.
- Accessing Canvas
 - <https://coursefinder.ucsd.edu/>
 - Login: UC San Diego Active Directory credentials

Instructional Assistants and Discussion Sections

Section	Day	Time	Instructional Assistant	Location
A01	Wednesday	3:00-3:50pm	Neva Olliffe nolliffe@ucsd.edu	ZOOM
			Emily Zhang eczhang@ucsd.edu	

DISCUSSION SECTIONS: Student attendance to discussion sections is **NOT MANDATORY**. With that said, I do encourage you to attend discussion section. Ms. Olliffe (Neva) will help you tackle the weekly problem sets, which reflect the materials that will be on the exam. Discussion sections also provide you with the opportunity to build relationships with fellow students and your Instructional Assistants. Ms. Emily Zhang is an undergraduate instructional assistant who will also assist us with this course.

Sections will meet for the first time on April 10. A 25-point problem set will be posted online for discussion in section meeting each week. Ms. Olliffe will run the discussion section via zoom at the scheduled time and location during which the problem set will be explained. However, you are expected to complete the problem set prior to attending the discussion section, because it is likely that there won't be sufficient time to go through every question. It is likely that the IAs will go through questions based on a priority list.

Grading Information

Points	Assignment
50	Mini quizzes
150	Discussion Section Problem Sets x 6
200	Exams x 2
400	Total
10	Bonus

- Grades will be assigned based on points earned using the scale listed above.
- Curving: If necessary, all point cutoffs will be adjusted downward so that at least 50% of the class receives an A or B. Under no circumstances will point cutoffs be adjusted upward.

Points earned	Percentile	Letter grade	P/NP
≥400	100	A+	P
≥360	90	A	P
≥348	87	A-	P
≥336	84	B+	P
≥320	80	B	P
≥308	77	B-	P
≥296	74	C+	P
≥280	70	C	P
≥268	67	C-	P
≥256	64	D+	NP
≥240	60	D	NP
≥228	57	D-	NP

Assessment

EXAMS (200 POINTS): There will be 3 equally weighted exams for the course, each worth 100 points. Your lowest exam score will NOT be counted towards your grade (i.e one exam will be dropped). **Exams will be administered in real time on Canvas/Zoom during the scheduled lecture time on the dates designated in the course schedule: April 26, May 17, and June 14.** The exams are **NOT cumulative**, and exam questions will only cover material taught in class and the discussion sections for each given module.

****Note: You must take all 3 exams for consideration of dropping 1 exam**

MINI QUIZZES (50 POINTS): Each lecture on Monday and Wednesday (no quiz for Friday) is followed by a mini quiz. Mini quizzes will be posted each week on Canvas. **You will have two attempts to complete your quiz.** They are intended to be like clicker questions and will be as closely aligned with learning objectives as possible. They simply aim to check your understanding and help you to test your grasp of the week's material. **Deadline: Tuesdays and Thursdays by midnight (see canvas).**

PROBLEM SETS (150 POINTS): Problem sets will be posted on Canvas each week in both Word and PDF format. There will be 7 problem sets, each worth 25 points. Your lowest problem set score will NOT be counted towards your grade (i.e one problem set will be dropped). Also, questions will reflect questions that will be on exams. For the entire quarter, problem sets will be discussed during our weekly discussion section, one problem set per section.

Credit for completing the assigned problem sets will be earned through submission via Canvas. Problem sets should be submitted electronically on Canvas, in PDF or doc. format.

Points will be awarded based on the completeness of your answers. **Deadline: Fridays by midnight (see canvas).**

BONUS EXTRA CREDIT POINTS:

10 points extra credit will be given to the entire class if 90% of the class fills out their CAPES and other surveys.

Biochemistry Flow: To help master content material and to build meaningful conceptual connections, 10 points extra credit will be given to those who write a biochemistry rap flow based on any content gone over class. This must be at least 10 lines long. Students may choose to read aloud to the rest of the class or post on the Canvas discussion board. HAVE FUN WITH IT!

LATE OR MISSING ASSIGNMENTS: Mini quizzes and problem sets will be due at the same time every week as stated above for problem set submissions and as clearly listed on Canvas. Late or missing assignments will NOT be graded.

***NOTE:** All questions and concerns in regards to assignment submission must be directed to your assigned IAs.

Course Policy

EXAMS

There will be no scheduled make-up exams. Failure to take the exam at the assigned time and place will result in a grade of zero for that exam. Extenuating circumstances related to a medical condition or disability, which prevents you from taking an exam at the scheduled time must be submitted in writing and include official documentation of the cause as far in advance as possible to the instructors. Once exams have been graded, you will be able to view your score at the course website. After the quarter you will also be able to view your final exam score and final grade at this location.

Exams will be administered synchronously over Canvas during the scheduled lecture time. Use of cameras, cell phones, tablets or other electronic devices capable of storing information is NOT allowed during the exams. Students may not work collaboratively or seek information from any external sources or notes during the exams.

Any student who is found cheating on the exams will be reported to the Academic Integrity Office according to university policy for an investigation into academic dishonesty (see section on Academic Integrity below).

Students suspected of AI violations on exams will be invited to follow-up meetings where they will be asked to justify their answers (before the graded exams or solutions are released). If the instructor isn't convinced during the meeting, or the student refuses to participate, they're submitted for AI violations.

REGRADES

If you discover an error in the grading of your exam, you may request a regrade by emailing the instructional assistant for your section within one week of when the graded exams are made available. You must also submit a cover letter which questions you request for regrading and sign the bottom of the letter.

Schedule of Learning Modules:

Module	Week	Lectures	Topic	Due Dates	✓
1	1	L1: M 4/1 zoom L2: W 4/3 zoom L3: F 4/5 zoom	1. Introduction of course/Overview 2. Water	No Discussion Section	
1	2	L4: M 4/8 zoom L5: W 4/10 L6: F 4/12	3. Amino acids, Peptides, and Proteins 4. 3D structure of proteins	Discussion section 1 Problem set 1 due (overview of topics 2 & 3)	
1	3	L7: M 4/15 L8: W 4/17 L9: F 4/19	5. Protein folding 6. Chaperones	Discussion section 2 Problem set 2 due (overview of topics 4 & 5)	
1	4	L10: M 4/22 L11: W 4/24 F 4/26 exam	7. Nucleotides and Nucleic Acids MODULE EXAM 1 (lectures 1-11)	Discussion section 3 Review for Exam 1	
2	5	L12: M 4/29 L13: W 5/1 L14: F 5/3	8. DNA Binding Proteins 9. Immune Binding Proteins	Discussion section 4 Problem set 3 due (overview of topics 7 & 8)	
2	6	L15: M 5/6 zoom L16: W 5/8 zoom L17: F 5/10 zoom	10. Oxygen Binding Proteins 11. Enzyme Function	Discussion section 5 Problem set 4 due (overview of topics 9 & 10)	
2	7	L18: M 5/13 L19: W 5/15 F 5/17 exam	12. Carbohydrates MODULE EXAM 2 (lectures 12-19)	Discussion section 6 Review for Exam 2	
3	8	L20: M 5/20 L21: W 5/22 L22: F 5/24	13. Lipids 14. Membrane Proteins	Discussion section 7 Problem set 5 due (overview of topics 12 & 13)	
3	9	M 5/27 HOLIDAY L23: W 5/29 L24: F 5/31	15. Signaling Pathways 1 16. Signaling Pathway 2	Discussion section 8 Problem set 6 due (overview of topics 14 & 15)	
3	10	L25: M 6/3 L26: W 6/5 L27: F 6/7	17. Careers in STEM 18. Overview of Lectures 12-16	Discussion section 9 Problem set 7 due (overview of topic 16 & review)	
Final Week	11	F 6/14 exam 8:00 – 10:59 am	MODULE EXAM 3 (lectures 13-27)		

Student Resources for Support and Learning

- **Library Help**

For questions about eReserves and research tools:

<https://library.ucsd.edu/ask-us/triton-ed.html>

- **Learning Resources**

[Writing Hub](#)

[Supplemental Instruction](#)

[Tutoring](#)

[Mental Health Services](#)

- **Community Centers**

Learn about the different ways UC San Diego explores, supports and celebrates the many cultures that make up our diverse community.

<https://students.ucsd.edu/student-life/diversity/index.html>

- **Accessibility**

Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD) which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to Faculty (please make arrangements to contact me privately) and to the OSD Liaison in the department in advance so that accommodations may be arranged.

Contact the OSD for further information: <https://disabilities.ucsd.edu/>.

● **Inclusion**

I am committed to creating a learning environment that supports diversity of thought, perspective, experience, and identity. This will be key to our success. Science is all about pooling insight and seeing problems from as many perspectives as possible. So, please share your thoughts.

I am also open to anonymous feedback am fully willing to facilitate it.

Office of Equity, Diversity, and Inclusion:

858.822.3542 | diversity@ucsd.edu | <https://diversity.ucsd.edu/>

<https://students.ucsd.edu/student-life/diversity/index.html>

<https://regents.universityofcalifornia.edu/governance/policies/4400.html>

● **Basic Needs**

Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in this course, is encouraged to contact:

foodpantry@ucsd.edu | basicneeds@ucsd.edu | (858)246-2632

● **Technical Support**

For help with accounts, network, and technical issues:

<https://acms.ucsd.edu/contact/index.html>

For help connecting to electronic library resources such as eReserves and e-journals:

<https://library.ucsd.edu/computing-and-technology/connect-from-off-campus/>

UC San Diego Academic Policies

- **ADMINISTRATIVE QUESTIONS**

To drop/add a class or with other similar questions/issues, please contact the Biology Undergraduate Student Affairs Office.

- **Academic Integrity**

Academic Integrity is expected of everyone at UC San Diego. This means that you must be honest, fair, responsible, respectful, and trustworthy in all of your actions. Lying, cheating, or any other forms of dishonesty will not be tolerated because they undermine learning and the University's ability to certify students' knowledge and abilities. Thus, any attempt to get, or help another get, a grade by cheating, lying or dishonesty will be reported to the Academic Integrity Office and will result in sanctions. Sanctions can include an F in the class and suspension or dismissal from the University. So, think carefully before you act. Before you act, ask yourself the following questions: a) is my action honest, fair, respectful, responsible, and trustworthy, and b) is my action authorized by the instructor? If you are unsure, don't ask a friend, ask your instructor, instructional assistant, or the Academic Integrity Office. You can learn more about academic integrity at academicintegrity.ucsd.edu.

(Source: Bertram Gallant, T. (2017). Teaching for integrity. UC San Diego Academic Integrity Office.)

Refer to:

[UCSD Student Conduct Code](#)

(https://students.ucsd.edu/_files/student-conduct/ucsandiego-student-conduct-code_interim-revisions1-16-18.pdf)

[Principles of Community](#)

(<https://ucsd.edu/about/principles.html>)

- **Religious Accommodation**

It is the policy of the university to make reasonable efforts to accommodate students having bona fide religious conflicts with scheduled examinations by providing

alternative times or methods to take such examinations. If a student anticipates that a scheduled examination will occur at a time at which his or her religious beliefs prohibit participation in the examination, the student must submit to the instructor a statement describing the nature of the religious conflict and specifying the days and times of conflict.

For final examinations, the statement must be submitted no later than the end of the second week of instruction of the quarter.

For all other examinations, the statement must be submitted to the instructor as soon as possible after a particular examination date is scheduled.

If a conflict with the student's religious beliefs does exist, the instructor will attempt to provide an alternative, equitable examination that does not create undue hardship for the instructor or for the other students in the class.

● **Discrimination and harassment**

The University of California, in accordance with applicable federal and state laws and university policies, does not discriminate on the basis of race, color, national origin, religion, sex, gender, gender identity, gender expression, pregnancy (including pregnancy, childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition, genetic information, ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (including membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services). The university also prohibits harassment based on these protected categories, including sexual harassment, as well as sexual assault, domestic violence, dating violence, and stalking. The nondiscrimination policy covers admission, access, and treatment in university programs and activities.

If students have questions about student-related nondiscrimination policies or concerns about possible discrimination or harassment, they should contact the Office for the Prevention of Harassment & Discrimination (OPHD) at (858) 534-8298, ophd@ucsd.edu, or reportbias.ucsd.edu.

Campus policies provide for a prompt and effective response to student complaints. This response may include alternative resolution procedures or formal investigation. Students will be informed about complaint resolution options.

A student who chooses not to report may still contact CARE at the Sexual Assault Resource Center for more information, emotional support, individual and group counseling, and/or assistance with obtaining a medical exam. For off-campus

support services, a student may contact the Center for Community Solutions. Other confidential resources on campus include Counseling and Psychological Services, Office of the Ombuds, and Student Health Services.

CARE at the Sexual Assault Resource Center

858.534.5793 | sarc@ucsd.edu | <https://care.ucsd.edu>

Counseling and Psychological Services (CAPS)

858.534.3755 | <https://caps.ucsd.edu>

Subject to Change Policy

The information contained in this course syllabus, other than the grade and absence policies, may be—under certain circumstances such as mutual agreement to enhance student learning—subject to change with reasonable advance notice.