

# CHEMISTRY 350 – MOLECULAR PRINCIPLES OF BIOCHEMISTRY

FALL 2024

<b>COURSE OVERVIEW</b>	<p>This course is designed to help students master the fundamental knowledge they need in order to understand the key molecular processes in biology. Instead of learning a large number of facts and observations, students are challenged to develop a deeper insight into the primary molecular principles operating behind biochemistry. The course will train students to use these concepts to understand how cells leverage fundamental chemical forces to perform important biological functions, emphasizing the interpretation of facts and the synthesis of knowledge by deduction, over memorizing details and specifics. Main topics include: biomolecular structures, protein and nucleic acid chemistry and functions, carbohydrates, lipid membranes, enzyme catalysis and kinetics, and biochemical signaling. In addition, a concise overview of molecular biology will be given, highlighting the key molecular processes central to metabolism and to gene expression and replication.</p>
<b>FACULTY</b>	<p>Professor Chi H. Mak Office: SSC 704 (213) 740-4101 cmak@usc.edu</p>
<b>OFFICE HOURS</b>	<p>Tu 2-3 W 4-5</p>
<b>LECTURE</b>	<p>TuTh 9:30-11 SGM 101 In-person lecture attendance is expected. There will be no Zoom or recordings.</p>
<b>DISCUSSION</b>	<p>Tu 12-1 DMC 257 W 12-1 KAP 134 W 1-2 KAP 134 W 2-3 SGM 226</p>
<b>TEACHING ASSISTANTS</b>	<p>TBA TBA</p>
<b>PREREQUISITE</b>	<p><u>Pre-requisite:</u> CHEM-105b, CHEM-115b or CHEM 108  Co-requisite: CHEM-322a or CHEM-325a Recommended preparation: BISC-220 or BISC-221</p>
<b>TEXTBOOKS</b>	<p><u>Required:</u> 1. <i>Fundamentals of Biochemistry: Life At The Molecular Level, 5<sup>th</sup> Edition</i>, by Voet, Voet and Pratt (2016, Wiley). (Note that we are still using the 5<sup>th</sup> edition instead of the new 6<sup>th</sup> edition.)  E-book available for 120-day rental <a href="https://www.vitalsource.com/products/fundamentals-of-biochemistry-donald-voet-judith-g-voet-v9781118918463">https://www.vitalsource.com/products/fundamentals-of-biochemistry-donald-voet-judith-g-voet-v9781118918463</a></p>
<b>WEBSITE</b>	<p>Brightspace will be used in this course for instructions, homework, discussions and for distribution of information. You will also be turning homework into Brightspace.</p>
<b>COVERAGE OF MATERIALS</b>	<p>Chapters 1 through 18, 20 and 21 will be covered in detail this semester. Overview of the topics in the rest of the book (Chapters 23 through 28) will be given towards the end of the course to highlight essential molecular biology topics such as gene expression, gene regulation mechanisms, DNA replication and repair.</p>

Reading and problem assignments are assigned after every lecture.

**Full attendance at all lectures is expected.** You are responsible for any announcements made in lecture and all materials presented, whether they are in the textbook or not.

**DISCUSSION** The weekly discussion section will be used to go over the homework and lecture materials, and for test prep.

Discussions will start the second week of class.

**HOMEWORK** Homework consists of weekly problem sets. Homework is assigned after every lecture.

Homework is due every Thursday online at the beginning of lecture. Each problem set you turn in should consist of **everything assigned in the week prior**.

Homework is graded for both completeness and correctness. For each problem set, 12 points will be given for submitting a complete homework, and 3 points will be given to one problem randomly selected to be graded for correctness.

**READING ASSIGNMENT** The lectures will not necessarily revisit every section in the textbook, especially the basic ones. It is therefore critical that you do the reading assignments. Reading assignment is posted on the web after every lecture. You should complete the reading assignment before the next class.

<b>GRADING</b>	One-Hour Exams	3 @100 points	300	(approximately 12 sets planned)
	Problem Sets	12 @15 points	180	
	Final Exam	1 @200 points	200	
	Total:		680	

The total score is used to assign course grades. There will be a distribution of grades in this class. On a traditional grade curve, the class average is usually the break point between B- and C+. For this class, the curve will be drawn such that the class average will approximately be the break point between an A- and a B+. Grades for this class will never be assigned just based on percentage of total points correct.

**EXAMS** There will be **three 1-hour exams given during the semester** scheduled for the 5<sup>th</sup>, 9<sup>th</sup> and 13<sup>th</sup> week of the course. The materials covered on each exam will be announced in lecture prior to the exam. The exams will be given during lecture time. The one-hour time period will be strictly enforced. No one will be allowed to enter the exam late or leave early. Bring your student I.D. and a calculator to all exams. Other than calculators, no electronic devices are allowed during exams.

**FINAL EXAM** **A comprehensive two-hour final exam will be given on Thursday, December 12th, 2022 at 11:00 am to 1:00 pm.** University policy dictates that all student must take the final exam for this class at the specified time. No early or makeup final are permitted.

**ABSENCES** **All unexcused absences from an exam will result in a zero.** Individuals with excused absences will be given special consideration at the end of the semester. Absences will be excused only on the basis of official university policies. To request an excused absence, bring verification to Prof. Mak prior to the absence, or in case of illness, immediately upon your return. All excuses will be verified.

**COPYRIGHTED MATERIALS** All course materials, including notes, slides, exams, exam keys, PRS questions, homework, homework solutions, discussion questions, case studies and videos are considered copyrighted materials. Any student who transmits any of these materials to unauthorized users who are not registered in the course is in violation of USC student conduct.

**Please do not re-distribute any course materials or transfer exams or slides or homework solutions to anyone, whether within USC or outside.**

## STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

### Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

### Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](https://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

### Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

## LECTURE AND EXAM SCHEDULE

Week	Topic	Reading	Problem Set Due	Exams & Special Dates
01	Essential Chemistry Background Water	Ch. 1 Ch. 2		
02	Nucleotides, Nucleic Acids and Genetic Information	Ch. 3	PS01	
03	Amino Acids Protein Primary Structures	Ch. 4 Ch. 5	PS02	Last Drop Date Sept 13
04	Protein Tertiary Structures	Ch. 6	PS03	
05	Protein Functions Carbohydrates (I)	Ch. 7 Ch. 8	PS04	<b>Exam 1</b> Sept 26
06	Carbohydrates (II) Lipids and Biological Membranes (I)	Ch.8 Ch. 9	PS05	
07	Lipids and Biological Membranes (II) Membrane Transport	Ch. 9 Ch. 10	PS06	Fall Recess Oct 10-11
08	Enzyme Kinetics, Inhibition and Control Enzyme Mechanisms (I)	Ch. 12 Ch. 11	PS07	
09	Enzyme Mechanisms (II) Biochemical Signaling	Ch. 11 Ch. 13	PS08	<b>Exam 2</b> Oct 24
10	Introduction to Metabolism Glycolysis	Ch. 14 Ch. 15	PS09	
11	Glycogen Metabolism & Gluconeogenesis The Citric Acid Cycle	Ch. 16 Ch. 17	PS10	
12	Electron Transport and Oxidative Phosphorylation Lipid Metabolism	Ch. 18 Ch. 20	PS11	Last W Date Nov 15
13	Amino Acid and Nucleotide Metabolism DNA Replication, Repair and Recombination	Ch. 21,24 Ch. 25	PS12	<b>Exam 3</b> Nov 21
14	Transcription and RNA Processing	Ch. 26		Thanksgiving Nov 28-29
15	Protein Synthesis Regulation of Gene Expression	Ch. 27 Ch. 28		
Final				<b>Final</b> Thursday, Dec 12