

CHEMISTRY 350 – MOLECULAR PRINCIPLES OF BIOCHEMISTRY

FALL 2021

COURSE OVERVIEW

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.

FACULTY

Professor Chi H. Mak
Office: SSC 704
(213) 740-4101
cmak@usc.edu

FOR FALL 2021

Students are expected to comply with all aspects of USC's COVID-19 policy. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards.

OFFICE HOURS

Tu 3-4
W 4-5

LECTURE

TuTh 9:30-11 SGM 101

DISCUSSION

Tu 11-12 GFS 204
Tu 12-1 GFS 212
W 12-1 GFS 218
W 1-2 GFS 218
W 2-3 GFS 205

TEACHING ASSISTANTS

Aneesh Deshmukh
aneeshde@usc.edu

Luna Kim
moonjung@usc.edu

PREREQUISITE

Pre-requisite: CHEM-105b, CHEM-115b or CHEM 108

Co-requisite: CHEM-322a or CHEM-325a

Recommended preparation: BISC-220 or BISC-221

TEXTBOOKS

Required:

1. *Fundamentals of Biochemistry: Life At The Molecular Level*, 5th Edition, by Voet, Voet and Pratt (2016, Wiley).

E-book available for \$39 for 120-day rental

<https://www.vitalsource.com/products/fundamentals-of-biochemistry-donald-voet-judith-g-voet-v9781118918463>

WEBSITE

Blackboard will be used in this course for instructions, homework, discussions and for distribution of information. You will also be turning homework into Blackboard.

SLACK

Slack is an online collaboration platform. Assignments and announcements will be posted on Slack in addition to on the class website. You may also ask questions on Slack. Prof. Mak, the TAs or other students can post responses.

Download the Slack app and join workspace "usechem-350fall2021.slack.com". (If you don't already have an account on Slack, it will ask you to create a new password. This should **not** be your USC email password or your CHEM 350 class password. Create your own unique password for your Slack account.)

Once you have successfully joined the CHEM 350 workspace, please update your profile with your real name so everyone knows who everyone is. (By default, Slack uses your email name for your profile.)

~~** Please make sure to practice common courtesy on Slack as on any other social platform when interacting with the rest of the class.~~

COVERAGE OF MATERIALS

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 other metabolic pathways, gene expression and regulation mechanisms, as well as DNA replication and repair.

Reading and problem assignments are assigned 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**.

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.

GRADING

One-Hour Exams	3 @100 points	300	(approximately 12 sets planned)
Problem Sets	12 @20 points	240	
Final Exam	1 @200 points	200	
Total:		740	

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 based on percentage of total points.

EXAMS

There will be three 1-hour exams given during the semester. 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 9th, 2021 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 code and will be reported to SJACS.

DO NOT re-distribute any course materials or transfer exams or slides or homework solutions to anyone. Students who distribute copyrighted course materials through any media external to or within USC will be reported to Student Judicial Affairs and Community Standards.

STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

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

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention and Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)- (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

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. The university prohibits discrimination or harassment based on the following *protected characteristics*: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

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

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

Campus Support & Intervention - (213) 821-4710

campussupport.usc.edu

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

Diversity at USC - (213) 740-2101

diversity.usc.edu

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

dps.usc.edu, emergency.usc.edu

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) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

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	
04	Protein Tertiary Structures	Ch. 6	PS03	
05	Protein Functions Carbohydrates (I)	Ch. 7 Ch. 8	PS04	Exam 1 Sept 23 rd
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	
08	Enzyme Kinetics, Inhibition and Control Enzyme Mechanisms (I)	Ch. 12 Ch. 11	PS07	Fall Recess
09	Enzyme Mechanisms (II) Biochemical Signaling	Ch. 11 Ch. 13	PS08	Exam 2 Oct 21 st
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	
13	Amino Acid and Nucleotide Metabolism DNA Replication, Repair and Recombination	Ch. 21,24 Ch. 25	PS12	Exam 3 Nov 18 th
14	Transcription and RNA Processing	Ch. 26		Thanksgiving
15	Protein Synthesis Regulation of Gene Expression	Ch. 27 Ch. 28		
Final				Final Exam Thursday, Dec 9 th