CHEMISTRY 350 – MOLECULAR PRINCIPLES OF BIOCHEMISTRY

FALL 2020

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

SPECIAL STATEMENT FOR FALL 2020 FROM PROFESSOR MAK

Since the Fall semester of 2020 is special because instructions and assessments will exclusively be online, several aspects of this course have been adjusted to work in this alternate modality, and the rest of this syllabus has been adapted from the regular syllabus of this course, with updates and modifications specific to the Fall 2020 semester.

There are several key differences in Fall 2020 compared to the regular course:

- The length of this semester will be 13 full weeks (with no fall break, and the semester will finish before Thanksgiving). But the lectures that cannot be fit into this 13-week semester will all be given to you on videos.
- To help you manage your effort and better keep track of your progress in this course, there will be six (6) 40-minute exams this semester (instead of three 1-hour midterms in the past). These exams will be given on Thursdays in week 3, 5, 7, 9, 11, and 13 of the semester. Shorter but more frequent tests will help break down the course materials into small aggregates and will also give you quicker feedback about how you are doing, and how you should adjust your study strategy for this course if necessary.
- The Tuesday (T) and Thursday (Th) lectures at 9:30 – 11:00 am are mandatory, and there will be real-time assessments during lectures. If you are in a time zone that is more than + or - 3 hours from Los Angeles local time, please contact Prof. Mak to make arrangements for when and how to participate.
- In a mostly remote learning environment, staying engaged with the course and staying current with the course materials is key to effective learning. Our experience tells us the more time you spend thinking about biochemistry and the more effort you put into it, the more you will learn and the better you will do in this class. In order to help you with this, Prof. Mak will be giving a live "chalk talk" every Monday (M) and Wednesday (W) at 5:00 – 5:45 pm, where I will discuss some of the key ideas of the next day's lecture on a virtual white board. While I recommend that you take advantage of these extra sessions, these chalk talks are optional. If you cannot join us live, you can watch them asynchronously. But these MW free-form chalk talks are not a replacement or a substitute for the formal TTh class lectures.
- The weekly discussion sections will also be conducted live, and they are led by the TAs. Discussions will give you important practice with biochemistry comprehension, and the TAs will also go over key problems and sample exam questions during the discussion sections. Please make sure you can attend your discussion section in real-time.
- Supplemental Instruction (SI) is offered for CHEM-350. Please take advantage of it.

OFFICE HOURS

Tu 1-2
Wed 3-4

LECTURE

Online (live and asynchronous)

DISCUSSION

Tu 11-12	online (live)
Tu 12-1	online (live)
Wed 12-1	online (live)
Wed 1-2	online (live)
Wed 2-3	online (live)

TEACHING ASSISTANTS

Huy (Ethan) Phan	Swetha Erukala	Nicole Pedowitz
ethanpha@usc.edu	erukala@usc.edu	npedowit@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

http://chemmac1.usc.edu/350

The class website will be used extensively in this course for instructions, homework, discussions and for distribution of information. Before you can access contents on this site, you need to set up your class password. Follow the "Setup your password" link.

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 "uscchem-350fall2020.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.

DISCUSSIONS

The weekly discussion section will be used to go over the homework and lecture materials and for test preparation.

Discussions will start the second week of class.

HOMEWORK

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

Homework is collected 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

Exams	6 @50 points	300	
Problem Sets	12 @20 points	240	(approximately 12 sets planned)
Final	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 six (6) 40-minute exams (or "midterms) 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. to all exams.~~

FINAL EXAM

A comprehensive 2-hour final exam will be given on Thursday, November 19th, 2020 at 8:00 am to 10:00 am. 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. Please contact the instructor if you have more than 2 finals scheduled for that day.

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 this 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.

Statement for Students with Disabilities:

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity:

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis:

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

LECTURE AND EXAM SCHEDULE

Week	Topic	Reading	Problem Set Due	Exams & Special Dates
1	Essential Chemistry Background Water	Ch. 1 Ch. 2		
2	Nucleotides, Nucleic Acids and Genetic Information	Ch. 3	#1	
3	Amino Acids Protein Primary Structures	Ch. 4 Ch. 5	#2	**Exam 1** Thursday, Sept 3th
4	Protein Tertiary Structures	Ch. 6	#3	
5	Protein Functions Carbohydrates (I)	Ch. 7 Ch. 8	#4	**Exam 2** Thursday, Sept 17th
6	Carbohydrates (II) Lipids and Biological Membranes (I)	Ch.8 Ch. 9	#5	
7	Lipids and Biological Membranes (II) Membrane Transport	Ch. 9 Ch. 10	#6	**Exam 3** Thursday, Oct 1st
8	Enzyme Kinetics, Inhibition and Control Enzyme Mechanisms (I)	Ch. 12 Ch. 11	#7	
9	Enzyme Mechanisms (II) Biochemical Signaling	Ch. 11 Ch. 13	#8	**Exam 4** Thursday, Oct 15th
10	Introduction to Metabolism Glycolysis	Ch. 14 Ch. 15	#9	
11	Glycogen Metabolism & Gluconeogenesis The Citric Acid Cycle	Ch. 16 Ch. 17	#10	**Exam 5** Thursday, Oct 29th
12	Electron Transport and Oxidative Phosphorylation Lipid Metabolism	Ch. 18 Ch. 20	#11	
13	Amino Acid and Nucleotide Metabolism DNA Replication, Repair and Recombination	Ch. 21,24 Ch. 25	#12	**Exam 6** Thursday, Nov 12th
Final				**Final Exam** Thursday, Nov 19th
* 14	Transcription and RNA Processing	Ch. 26		
* 15	Protein Synthesis Regulation of Gene Expression	Ch. 27 Ch. 28		Thanksgiving

* Outside of 13-week semester