

BISC 330L: Biochemistry

4 units

Fall 2017

Monday, Wednesday and Friday—12-12:50 p.m.

Room: SOS B2

Website: MasteringChemistry, BANCROFT330F2017

Instructor: Christa Bancroft, Ph.D.

Office: ZHS470

Office Hours:

Monday 10:45-11:45 a.m.

Thursday 11:45-12:45 a.m.

Contact Info:

Email: cbancrof@usc.edu (best choice)

Phone number: 213-740-5552

I will typically reply to emails within 24 hours during the workweek and 48 hours over the weekend.

Lab Manager: Xiaojun Zhang, Ph.D.

Office: SGM304

Office Hours:

Contact Info:

Email: xiaojunz@usc.edu

Phone number: 213-458-3224

Teaching Assistant: TBD

Office:

Office Hours:

Contact Info:

Pearson Help: <https://support.pearson.com/getsupport/s/>

Course Topic Description

Biochemical bonds and reactions. Interactions with water molecules. Energetics of biochemical reactions. Structure and function of DNA, RNA, proteins, lipids and carbohydrates. Enzyme kinetics and mechanisms. Enzyme cofactors and vitamins. Enzyme regulatory strategies. Glucose oxidation and ATP production: glycolysis, citric acid cycle & oxidative phosphorylation. Glucose and O₂ production by photosynthesis in plant chloroplasts. Ribose biosynthesis from glucose by pentose phosphate pathway. Lipid catabolism by beta-oxidation. Coordination of metabolism by hormonal signals. Techniques used to study biochemical pathways will be presented in the context of these major biological mechanisms.

Learning Objectives

1. Relate covalent and non covalent interactions to their importance in biological interactions and structures.
2. Identify the amino acids and their chemical properties. Analyze how their presence in a protein changes it's overall characteristics.
3. Identify the levels of structure in proteins and describe the stabilization of these structures.
4. Describe the structure and mechanism of representative enzymes in biochemical pathways.
5. Interpret plots of enzyme kinetic data both with and without inhibitors.
6. Describe the primary catabolic and anabolic pathways pertaining to the following molecular classes (Glycolysis, Citric Acid Cycle, Electron Transport, Oxidative Phosphorylation, Pentose Phosphate

Pathway, Light and Dark Photosynthetic Reactions, Calvin Cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis and Beta-Oxidation):

- a. Carbohydrates
- b. Lipids
7. For each pathway in 6, identify the key regulatory points, the energetics of the reactions, the enzymes and the chemical transformations involved. Analyze how energetic changes and hormonal signals modify the reactions and change the active pathways.
8. Identify important characteristics of lipid membrane structure and compare mechanisms of molecular transport across membranes.
9. Evaluate how organismal energy state and hormonal signals modify activation and inhibition of different biochemical pathways.
10. Compare major cellular signaling pathways (Tyrosine kinase receptors, G-protein coupled receptors and steroid receptors).
11. Interpret biochemical data tables.

Prerequisite: CHEM 322A (Organic Chemistry)

Course Notes

Lectures: The lecture slides posted on the course Blackboard internet site (<https://blackboard.usc.edu>). All lectures will have an audio and written transcript section that should be read or listened to at home before coming to lecture that day. It is also recommended to read to corresponding section of the textbook in preparation for in-class problem sets. There will be in-class quiz questions associated with the at-home portion of the lecture. The remainder of the lecture slides will be presented in class.

It is important to attend all of the lectures during the course and to take good notes for study. Prior to attending each lecture, it is also recommended to read the appropriate portions of the textbook. Examinations will be based on application of material from lecture slides, verbal information conveyed during lecture, in-class quiz material, and in-class problem sets. Material from the textbook that is not presented in lecture slides or in the lecture presentation will not be included in examination material. All course material, information, announcements and grades will be posted on Blackboard until the end of the semester.

Email Communication:

To ensure privacy, only student's USC email accounts may be used for email communications. Students are responsible for understanding the content of email messages that the instructor sends to their USC accounts. Therefore, each student must check their USC email regularly and make sure their account is not over quota, so new messages can be received.

Required Readings and Supplementary Materials

Appling, Anthony-Cahill, Mathews, Biochemistry: Concepts and Connections (2015, 1st edition), plus Pearson, Mastering Chemistry on-line learning program. Can be purchased as a package in the bookstore, along with e-textbook, or separately.

Description and Assessment of Assignments

Midterms will include multiple choice, short answer and mathematical problems that can be done without a calculator. Quizzes will be on material from the at-home portion of the lecture material and can be answered individually, in pairs or small groups. Points will be given both for participation and correctness. Problem sets will be on material from the entirety of the lecture. Problems will be completed in pairs or small groups. Groups might be asked to present their thought process and solution to the class. Individuals within a group should all contribute equally to the workload. Points will be given for both participation and correctness.

Grading Breakdown

The course grade will be based upon 1280 possible points:

Assignment	Points	% of Grade
Midterm 1	250	19.53
Midterm 2	250	19.53
Final Exam	250	19.53
In-class quizzes	80	6.25
In-class problem sets	200	15.63
Laboratory	250	19.53
Total	1280	100

Course letter grades:

Course final grades will be determined using the following scale:

A 90-100

A- 87-89.9

B+ 82-86.9

B 77-81.9

B- 72-76.9

C+ 67-71.9

C 62-66.9

C- 57-61.9

D+ 52-56.9

D 49-51.9

D- 46-48.9

F 45 and below

Assignment Submission Policy

Answers to quiz questions should be submitted within the two minute time-frame after a quiz question is opened in class using a smart phone, tablet or laptop computer.

Answers to group work assignments should be submitted before lecture section ends at 12:50 p.m.

If you do not have access to a smart phone, tablet or laptop computer, please see Dr. Bancroft to make accommodations to submit your assignments.

Grading Timeline

Grades for Midterm Exams will be posted within one calendar week following the exam date.

Additional Policies

Missing Midterm Exam:

In case a midterm exam must be missed for legitimate reasons, discuss the situation with the course instructor prior to the exam, if possible. If an exam is missed for an emergency or for a valid health reason (with written documentation), the scores of the other two exams will be prorated to comprise your total point score. Rules governing exams are given in more detail in your Student Contract, which is also posted on the class website: <https://blackboard.usc.edu>.

Regrades:

In the event an error is made in the grading of your exam, written submittal of a description of the error with the exam should be returned to Dr. Bancroft within a week after receiving your graded exam. After this time period, exams will not be regraded.

Lecture Absences:

Attendance at all lecture sections is expected. If you must miss class due to illness or valid USC travel, please present Dr. Bancroft with evidence of the reason for absence and you will be allowed to make-up in-class work assignments within 1 week of the missed lecture period.

Course Schedule:

Wk.	Date	Lecture Topic	Reading	Due (in class)
1	Aug. 21	Intro to Biochemistry and the Language of Chemistry	Ch. 1	
	Aug. 23	Chemical Foundations of Life	Ch. 2	Lec 2 quiz & prob. set
	Aug. 25	Energy in Biochemistry	Ch. 3	Lec 3 quiz & prob. set
2	Aug. 28	Energy in Biochemistry	Ch. 3	Lec 4 quiz & prob. set
	Aug. 30	Nucleic Acids	Ch. 4	Lec 5 quiz & prob. set
	Sept. 1	Amino Acids and Primary Structure	Ch. 5	Lec 6 quiz & prob. set
3	Sept. 4	No lecture, Labor Day		
	Sept. 6	Protein Structure	Ch. 6	Lec 7 quiz & prob. set
	Sept. 8	Protein Structure and Biochemical Methods	Ch. 6	Lec 8 quiz & prob. set
4	Sept. 11	Biochemical Methods	Ch. 6	Lec 9 quiz & prob. set
	Sept. 13	Enzymes	Ch. 8	Lec 10 quiz & prob. set
	Sept. 15	Enzymes	Ch. 8	Lec 11 quiz & prob. set
5	Sept. 18	Enzymes	Ch. 8	Lec 12 quiz & prob. set
	Sept. 20	Enzymes	Ch. 8	Lec 13 quiz & prob. set
	Sept. 22	Carbohydrates	Ch. 9	Lec 14 quiz & prob. set
6	Sept. 25	Midterm 1		
	Sept. 27	Lipids, Membranes and Cellular Transport	Ch. 10	Lec 15 quiz & prob. set
	Sept. 29	Lipids, Membranes and Cellular Transport	Ch. 10	Lec 16 quiz & prob. set
7	Oct. 2	Lipids, Membranes and Cellular Transport	Ch. 10	Lec 17 quiz & prob. set
	Oct. 4	Principles of Metabolism	Ch. 11	Lec 18 quiz & prob. set
	Oct. 6	Principles of Metabolism	Ch. 11	Lec 19 quiz & prob. set
8	Oct. 9	Carbohydrate Metabolism	Ch. 12	Lec 20 quiz & prob. set
	Oct. 11	Carbohydrate Metabolism	Ch. 12	Lec 21 quiz & prob. set
	Oct. 13	Carbohydrate Metabolism	Ch. 12	Lec 22 quiz & prob. set
9	Oct. 16	Carbohydrate Metabolism	Ch. 12	Lec 23 quiz & prob. set
	Oct. 18	Carbohydrate Metabolism	Ch. 12	Lec 24 quiz & prob. set
	Oct. 20	Carbohydrate Metabolism	Ch. 12	Lec 25 quiz & prob. set
10	Oct. 23	TCA Cycle	Ch. 13	Lec 26 quiz & prob. set
	Oct. 25	TCA Cycle	Ch. 13	Lec 27 quiz & prob. set
	Oct. 27	Midterm 2		
11	Oct. 30	Electron Transport and Ox. Phosphorylation	Ch. 14	Lec 28 quiz & prob. set
	Nov. 1	Electron Transport and Ox. Phosphorylation	Ch. 14	Lec 29 quiz & prob. set
	Nov. 3	Electron Transport and Ox. Phosphorylation	Ch. 14	Lec 30 quiz & prob. set
12	Nov. 6	Electron Transport and Ox. Phosphorylation	Ch. 14	Lec 31 quiz & prob. set
	Nov. 8	Photosynthesis	Ch. 15	Lec 32 quiz & prob. set
	Nov. 10	Photosynthesis	Ch. 15	Lec 33 quiz & prob. set
13	Nov. 13	Photosynthesis	Ch. 15	Lec 34 quiz & prob. set
	Nov. 15	Calvin Cycle	Ch. 15	Lec 35 quiz & prob. set
	Nov. 17	Calvin Cycle	Ch. 15	Lec 36 quiz & prob. set
14	Nov. 20	Lipid Metabolism	Ch. 16	Lec 37 quiz & prob. set
	Nov. 22	No lecture, Thanksgiving		
	Nov. 24	No lecture, Thanksgiving		
15	Nov. 27	Coordination of Energy Metabolism	Ch. 17	Lec 38 quiz & prob. set
	Nov. 29	Coordination of Energy Metabolism	Ch. 17	Lec 39 quiz & prob. set
	Dec. 1	Cell Signaling	Ch. 20	Lec 40 quiz & prob. set
	Dec. 8	Final Exam: 11-11:50 a.m.		

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" <https://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, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 - 24/7 on call

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

<https://engemannshc.usc.edu/counseling/>

National Suicide Prevention Lifeline - 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

<http://www.suicidepreventionlifeline.org>

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

Office of Equity and Diversity (OED)/Title IX Compliance - (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

Student Support and Advocacy - (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

<https://studentaffairs.usc.edu/ssa/>

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

<http://emergency.usc.edu>

USC Department of Public Safety - 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.

Provides overall safety to USC community. <http://dps.usc.edu>