

BISC 330L: Biochemistry
Lecture Syllabus, USC Spring 2022

Course Topics: Biochemical bonds and reactions. Interactions with water molecules. Structure/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. Mastery of these topics will provide students with a solid foundation in basic biochemical principles. Techniques used to study biochemical pathways will be presented in the context of these major biological mechanisms.

Lecture Day/Time:

Monday, Wednesday and Friday 11:00-11:50 a.m. (Section 13023)
Monday, Wednesday and Friday 12:00-12:50 p.m. (Section 13024)

Instructors:

- Dr. Nancy Castro
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- Dr. Xiaojiang Chen
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- Dr. Grayson Jagers
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Laboratory Manager:

Eric Noakes
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Email Communication:

Please allow up to 24 hours for a response from the lecture and laboratory instructors. 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.

Prerequisite: CHEM 322A (Organic Chemistry)

Textbook: Berg, Tymoczko & Stryer, BIOCHEMISTRY (9th, 2019)
BISC 330L Lab Manual (Provided for you online)

| Wk. | Date | Lecture Topic | Reading |
|-----|--------------|---|-------------|
| 1 | Jan. 10 (XC) | Introduction: chemistry of life process | 1.1-1.2 |
| | Jan. 12 | Water, pH and acid/base equilibria | 1.3 |
| | Jan. 14 | DNA discovery & genomic revolution | 1.4 |
| 2 | Jan. 17 | No Lecture – MLK Day | |
| | Jan. 19 | Amino acid structures & properties | 2.1 |
| | Jan. 21 | Primary structure of proteins | 2.2 |
| 3 | Jan. 24 | Primary structure of proteins | 2.3 |
| | Jan. 26 | Tertiary & quaternary structures | 2.4 - 2.6 |
| | Jan. 28 | Protein purification methods | 3.1 |
| 4 | Jan. 31 | Amino acid analysis & sequencing | 3.2, 3.3 |
| | Feb. 2 | Protein structure determination | 3.5 |
| | Feb. 4 | Protein structure determination | 3.5 |
| 5 | Feb. 7 | DNA replication & gene expression | 4.1 - 4.7 |
| | Feb. 9 (NC) | Enzymes: Basics | 8.1 - 8.2 |
| | Feb. 11 | Enzymes: Transition State | 8.3 |
| 6 | Feb. 14 | Enzymes: Michaelis-Menten; Inhibition | |
| | Feb. 16 | Enzymes: Catalytic Strategies | 8.4 – 8.5 |
| | Feb. 18 | Enzymes: Regulatory Strategies | 9 |
| 7 | Feb. 21 | No Lecture – President's Day | 10 |
| | Feb. 23 | Carbohydrates | 11 |
| | Feb. 25 | Lipids and Cell Membranes | 12.1 – 12.3 |
| 8 | Feb. 28 | Lipids and Cell Membranes | 12.4 – 12.6 |
| | Mar. 2 | Membrane Channels & Pumps | 13 |
| | Mar. 4 | Signal Transduction Pathways | 14 |
| 9 | Mar. 7 (GJ) | Introduction to Metabolism | 15 |
| | Mar. 9 | Introduction to Metabolism | 15 |
| | Mar. 11 | Glycolysis | 16 |
| | Mar. 13-20 | Spring Recess | |
| 10 | Mar. 21 | Regulation of Glycolysis | 16 |
| | Mar. 23 | Gluconeogenesis | 16 |
| | Mar. 25 | Glycolysis and Review | 16 |
| 11 | Mar. 28 | The Citric Acid Cycle | 17 |
| | Mar. 30 | The Citric Acid Cycle | 17 |
| | Apr. 1 | Oxidative Phosphorylation | 18 |
| 12 | Apr. 4 | Oxidative Phosphorylation | 18 |
| | Apr. 6 | Oxidative Phosphorylation | 18 |
| | Apr. 8 | Oxidative Phosphorylation | 18 |
| 13 | Apr. 11 | Photosynthesis | 19 |
| | Apr. 13 | Photosynthesis | 19 |
| | Apr. 15 | Photosynthesis | 19 |

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| 14 | Apr. 18 | The Calvin Cycle | 20 |
| | Apr. 20 | The Calvin Cycle | 20 |
| | Apr. 22 | The Pentose Phosphate Pathway | 20 |
| 15 | Apr. 25 | Glycogen | 21 |
| | Apr. 27 | Fatty Acid Metabolism | 22 |
| | Apr. 29 | Review for Final Exam | |
| | TBD | Final Exam | |

Exam Dates:

Midterm 1: Tuesday, February 15, 4:00-4:50pm

Midterm 2: Tuesday, March 29, 4:00-4:50pm

Final Exam:

Exam Information:

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, 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>.

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

Course Grades:

The course grade will be based upon **1000** possible points:

250 pts. Midterm 1

250 pts. Midterm 2

250 pts. Final Exam

250 pts. Laboratory (see lab syllabus for specific assignments)

Lectures:

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 important to have read the appropriate portions of the textbook. However, many of the lectures will contain new and additional information that is not in the textbook. Examinations will be based mainly on information given in the lectures. In studying for examinations, complete and accurate lecture notes are of prime importance.

The lecture slides posted on the course Blackboard internet site (<https://blackboard.usc.edu>), may contain material that is not in the lectures—and the lectures may contain information that is not conveyed in the Blackboard lecture summaries. The lecture slides, as posted on

Blackboard, and the textbook are intended to be helpful, but auxiliary to the lectures. All course material, information, announcements and grades will be posted on Blackboard until the end of the semester.

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 Section 11, *Behavior Violating University Standards*<https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. 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/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Statement For Students With Disabilities

Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to Dr. Mathews as early in the semester as possible. DSP is located in STU 301 and is open 8:30am–5:00pm, Monday through Friday. The phone number for DSP is (213) 740-0776. For more information, please visit the following link: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html