

Chemistry 370/470
Biochemistry
Fall 2019

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Lectures: 2:45 – 3:35 pm on MWF in Flanner 007
Discussions: Monday 1:40 pm in LSB 212

TENTATIVE SCHEDULE OF LECTURES AND QUIZZES

#	Day	Date	Subject	Chapters
1	M	8/26	Introduction & Biomolecules	1
2	W	8/29	Water & pH	1
3	F	8/30	Water & pH	1
4	M	9/2	Labor Day – no class	
5	W	9/4	Amino Acids, Peptides and Proteins	2
6	F	9/6	Amino Acids, Peptides and Proteins	2
7	M	9/9	Exploring Proteins	3
8	W	9/11	Exploring Proteins	3
9	F	9/13	Flow of Genetic Information	4
10	M	9/16	Genetic Code	4
11	W	9/18	Exploring Genes	5
12	F	9/20	Exploring Genes	5
13	M	9/23	Test 1	1 – 5
14	W	9/25	Evolution & Bioinformatics	6
15	F	9/27	Evolution & Bioinformatics	6
16	M	9/30	Hemoglobin	7
17	W	10/2	Hemoglobin	7
18	F	10/4	Enzymes: Basic Concepts & Kinetics	8
19	M	10/7	Fall Break – no class	
20	W	10/9	Enzymes: Basic Concepts & Kinetics	8
21	F	10/11	Enzymes: Catalytic Strategies	9
22	M	10/14	Enzymes: Catalytic Strategies	9
23	W	10/16	Regulation: Enzymes	10
24	F	10/18	Regulation: Enzymes	10
25	M	10/21	Test 2	6 – 10
26	W	10/23	Carbohydrates	11
27	F	10/25	Lipids and Membranes	12
28	M	10/28	Lipids and Membranes	12
29	W	10/30	Channels and Pumps	13
30	F	11/1	Channels and Pumps	13
31	M	11/4	Signal Transduction	14
32	W	11/6	Signal Transduction	14

33	F	11/8	Signal Transduction	14
34	M	11/11	Test 3	11 – 14
35	W	11/13	Metabolism and Bioenergetics	15
36	F	11/15	Glycolysis and Gluconeogenesis	16
37	M	11/18	Glycolysis and Gluconeogenesis	16
38	W	11/20	Glycolysis and Gluconeogenesis	16
39	F	11/22	Citric Acid Cycle	17
40	M	11/25	Citric Acid Cycle	17
	W	11/27	Thanksgiving Break – no class	
	F	11/29	Thanksgiving Break – no class	
41	M	12/2	Oxidative Phosphorylation	18
42	W	12/4	Oxidative Phosphorylation	18
43	F	12/6	Integration of metabolism	27
	F	12/13	4:15 pm Final Examination	15-18 & 27 plus 1-15

Discussion Activities:

There will be an opportunity in all discussion sections for you to ask questions but most of these sections (except the ones before a test) will have activities planned for them.

Week	Dates	Activity
1	8/26	Normal & Complex pH problems
	9/2	Labor Day – no class
2	9/9	Amino Acids, Proteins & pH problems
3	9/16	Amino Acid Sequencing
4	9/23	Prep for test 1
5	9/30	VMD -protein structure – bring your laptop if you have one
	10/7	Fall Break
6	10/14	Enzyme Evolution paper & kinetics problems
7	10/21	Prep for test 2
8	10/28	Comparative Modeling
9	11/4	Comparative Modeling
10	11/11	Prep for test 3 – You can attend both sessions.
11	11/18	Metabolism
12	11/25	Molecular Dynamics
13	12/2	Control of metabolism
14	TBA	Prep for final exam

Problem Due Dates: Assignments are due at the beginning of discussion.

Problem Set	Due Date	Topic
1	9/4	pH problems (due on Wednesday)
2	9/9	amino acids and proteins
3	9/16	amino acid sequence problems
4	9/23	genes
5	9/30	hemoglobin
6	10/9	enzyme kinetics (due on Wednesday)

7	10/14	enzyme catalysis and regulation
	10/21	no problems due
8	10/28	carbohydrates, lipids and membranes
9	11/4	signal transduction
10	11/13	metabolism (due on Wednesday)
11	11/18	glycolysis & gluconeogenesis
	11/25	Thanksgiving – no problems
12	12/2	citric acid cycle & ox-phos
13	12/6	integration of metabolism (due on Friday)

Pre-requisites: Organic Chemistry CHEM 222 or 224 and 226

Course Description: This is the first part of a two-semester Biochemistry series that emphasizes important biochemical concepts on the structure and function of proteins, enzymes, carbohydrates, lipids and cell membranes as well as on the bioenergetic and regulatory principles behind the central and carbohydrate pathways.

Outcome: Students will be able to demonstrate and understanding of structural-functional relationships in biological molecules and how carbohydrates are metabolized.

Required Text: Berg, Tymoczko, Gatto and Stryer, *Biochemistry*, 9th Ed.

You should read the appropriate chapter **before** class. Please realize that I will not have time to lecture on every topic but will emphasize what I consider to be the most important topics. Obviously, these more important topics will be emphasized on examinations but you are responsible for all of the text, lecture and discussion material.

Recommended Text: Deis, et al. (2011) 7th edition, *Student Companion to Accompany Biochemistry*.

Office Hours: MWF 3:40 – 4:40 pm. If you cannot make these times, please e-mail me to set up an appointment.

Grading Policy: There are 3 tests and a final examination during the course. There will be 100 points possible on each test and 200 on the final. The final examination will be 50% on new material and 50% on the material covered in Tests 1 to 3. If one of the regular examinations is the lowest score, it will be dropped and the final will count 200 points. If the final examination is the lowest score, then all four examinations will count 100 points each. In addition there will be homework problems worth at total of 50 points that will be graded only on the basis of being honestly attempted and turned in on time. You may work these problems in groups but I would like written answers from each you individually. Finally, there will be an additional 50 points assigned to the discussion sections. This will be graded on participation in the Discussion Section activities

(20 points), including assignments turned in as part of the discussion section activities. These activities include the computer modeling assignments (30 points). (Note: There are additional graphics projects for students in the graduate (Chem 461) version of the course that must be completed to credit for the Discussion and computer modeling.) Thus the course grade will be determined on the basis of 500 possible points. The course is curved. There will be a cumulative curve given in class after each examination so that you will always know how you are doing. No make-up tests will be given. If you miss a test for any reason, then your final will automatically count 200 points. If you miss more than one test a make-up examination will be given at my discretion. Minimally, a written doctor's or judge's note and notification prior to the quiz (via phone or e-mail) will be needed for any missed test to be made up.

Note that the last day to withdraw from the course without getting a WF is Friday, Nov. 1.

Tests: The tests will be a mixture of multiple choice, problems and short essays.

Final Examination: The University sets the schedule for all final exams. The final will be held on: **Friday, 12/13 from 4:15 to 6:15 pm in Flanner 007**. You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you arrive late. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either. Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams. Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. A student having four final examinations scheduled for the same date should e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (aptricoski@luc.edu).

Independent Effort: Students are referred to <http://www.luc.edu/media/lucedu/cas/pdfs/academicintegrity.pdf> for the CAS Statement on Academic Integrity. Students are advised to download and read the statement as it will be part of the governance of their efforts in the course. In addition, as pre-professional students at Loyola University Chicago, it should be obvious at this stage of your careers that all answers on examinations must arise from independent, honest efforts. Nothing less is acceptable in the Land of Lincoln. Thus, any student found cheating on any examination will receive an automatic "0" for that examination. His (her) name will be reported to Prof. Ballicora, the Chairperson of the Chemistry and Biochemistry Department, as well as to the Dean of the College of Arts and Sciences, who will decide whether further disciplinary action is necessary. We remind you that such an incident will become part of one's personal record and may be transmitted to organizations such as medical schools, dental schools, pharmacy programs, graduate programs, etc. Together, we encourage you to become the best that you can be, and will work with you to achieve that goal.

Appropriate In-class Behavior and Electronic Devices: In this course it is incumbent upon you, as a student, to maintain a professionalism and code of conduct appropriate with the course material and course enrollment. To this end, rude, disruptive behavior (such as talking during class, viewing computer materials not concerning class subjects, etc...) **will not be tolerated**. It is acceptable to use laptops or comparable devices (tablets, iPads, etc.) for taking notes in class. Recording is allowed. Cell phones, pagers, wireless PDAs, etc. must be turned off during class. If your device is activated during class, you must leave the class immediately and cannot return for the duration of that class period.

Panopto: Except when technical problems prevent it, I will record all of the lectures on Panopto and make these available on the Sakai site.

Sakai: I plan to use the Sakai website (see link on LUC website) for all class notes and announcements. Please ask me for a handout for instructions on how to use this site if you are not already familiar with it. It is essential that you access the site regularly to do well in this class.

Help Sessions: We will have the hour before each exam to answer last minute questions you have on the material.

Course Repeat Rule: Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website:<http://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

Students with Disabilities: If you have any special needs, please let me know in the first week of classes. The university provides services for students with disabilities. Any student who would like to use any of these university services should contact the Services for Students with Disabilities (SSWD), Sullivan Center, (773) 508-3700. Further information is available at <http://www.luc.edu/sswd/>.

Loyola University Absence Policy for Students in Co-Curricular Activities: Students missing classes while representing Loyola University Chicago in an official capacity (e.g. intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes. Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation (develop standard form on web) describing the reason for and date of the absence. This documentation must be signed by an appropriate

faculty or staff member, and it must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time. (<https://www.luc.edu/athletheadvising/attendance.shtml>)

Graduate Version of the Course: Chem 470 is the graduate version of this Biochemistry course. It requires students to learn additional skills not required for the undergraduate (Chem 370) course that will be helpful in their careers as professional biochemists and chemists. These skills involve more advanced molecular modeling assignments that will increase their knowledge of molecular structure and how that relates to biological function. In addition to the generation of a diagram of a protein structure done by the undergraduates, the additional assignments include the following:

1. Generation of diagrams of DNA structure
2. Generation of diagrams of t-RNA structure
3. Generation of diagrams of a polysaccharide structure
4. Generation of a diagram of a protein-nucleic acid complex structure
5. Running an energy minimization of a small protein.
6. Running and analyzing a molecular dynamics simulation of a small protein.