Principles of Biochemistry II
Chemistry 5710 Spring 2021

Section 1, M W F, 10:30-11:20 AM
Professor Joanie M. Hevel
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Office Hours: Wednesday 1-2; Thursday 1-2; other times by appointment.

Text: "Lehninger Principles of Biochemistry", Nelson and Cox, 6th ed. or a comparable two semester text (e.g. Voet and Voet, Garrett & Grisham).

CANVAS I will be using CANVAS for the management of Chem 5710. All materials (downloadable PDF, Word, PowerPoint, or video files) will be posted on CANVAS. Importantly, ***you will take your weekly quizzes using CANVAS.***

How will class work this year? All class lectures will be pre-recorded and available on CANVAS. I hope to have the entire week's worth of lectures available each Sunday night. Copies of my lecture slides will also be posted on Canvas. I strongly recommend downloading and printing the appropriate slides BEFORE listening to the video and using them to take your notes while listening. During the week I will be available in Zoom to address questions during the normal class time 10:30-11:20. It is **CRITICAL** that you do not get behind and do not wait until Thursday night to watch all of the week's videos at once.

Prerequisites A full year of organic chemistry (Chem 2310-2320, or equivalent) & Chem 5700 (C-)

Provisions: The administration of Chem 5710 will adhere strictly to the regulations outlined in the Spring Semester Schedule of Classes. Per instructions from the Dean's office, no assignments will be accepted or graded from students not formally enrolled in the course. Students not enrolled in the course may sit in only with instructor approval.

Course Content: Chemistry 5710 is the second of a two semester course sequence in Biochemistry. The intent of this sequence is to provide a thorough and comprehensive survey of biochemistry for science majors (undergraduates and graduates). Chemistry 5710 will focus on anabolism, signaling and information pathways. On the following pages is a tentative outline of the topics to be covered over the semester.

Quizzes Quizzes will cover material presented in the previous week's lecture **AND/OR** in the reading material. The quizzes are to be taken on-line using CANVAS. The quizzes are open book but should be worked individually (i.e. no help from classmates, etc). The intent of the quizzes is to keep you on top of the course material- i.e. not waiting until exam time to cram. These quizzes will require you to spend time reviewing the material. You will have **20 minutes to answer 10 questions** (1 point for each question). A total of 11 quizzes will be given during the semester. Each student will be allowed to drop the lowest graded quiz. Quizzes will **open up on Thursday 6am and close on Saturday at midnight**. I will not reopen a quiz for anything other than a birth, death, wedding, med school/grad school/job interview or scientific conference.

UTFs There are 2 UTFS for the course: Alex Lyons (Alex.Lyons@usu.edu) and Porter Ellis (pkreyellis@aggiemail.usu.edu). UTFs will run a weekly review session if there is interest. Alex and Porter are valuable resources for this course. I expect that they be treated with the same respect that you extend to me. They will not "give you answers"-they have been instructed to help guide you, but to not give you the answers to problem sets. The UTFs also are in charge of the weekly quizzes. **Questions about the quizzes should be directed to them**.

In-Class Discussions & Critical Research Problem Sets:

Critical thinking and creative problem solving are invaluable skills for students of all fields. Like Chem 5700, Chem 5710 is an upper division course designed to arm you with the knowledge necessary to address technically challenging problems. Over the semester we will have 2 types of activities: 1) in-class group discussions (**not graded, not turned in**) and 2) take-home critical thinking / writing problem sets (**graded**). The goal of these assignments is to promote problem solving that requires you to put together what you have learned in order to effectively address a problem that you have not been directly exposed to previously or to identify deficiencies in your current thought processes. **Additionally, specific questions will require a grammar-correct, logical narrative, allowing you to practice the skill of scientific writing.**

In-class discussions (not graded, not turned in): Occasionally we will break into groups in class to study a topic related to the current lecture material. This year this will be done in Zoom breakout rooms and I will try my best to schedule these for **Wednesdays** during the normal protected class time of 10:30-11:30. They are designed to help you understand the course material from a different perspective. Although I will make any worksheets available to students who are not present in class, it will be difficult to recapitulate the experience on your own so I highly recommend that you attend these breakout sessions. **These will not be graded and are not turned in**. However, if we do not complete everything on the worksheet, the work may become part of the Critical Research Problem Set.

Critical Research /Writing Problem Sets (graded): Some class discussions will segue into a research problem set that will be due approximately one week after the class discussion. The problem sets are meant to give you practice at applying the course information (versus regurgitating it) **AND** practice at writing. A significant amount of effort will be required to finish the Research Problems and will likely require you to use on-line databases, read articles from the primary literature, etc. Because you will have a week to complete these, I will **expect narratives that show your ability to use correct grammar/spelling**. All "data" collected from the internet will need to be properly referenced. **Primary literature (no reviews) from journals having an impact factor of 2 or greater are the only references that should be used.** Please be aware that there is a Science Writing Center (https://writing.usu.edu/programs/sci-writing). They will even accept drafts of your narratives prior to meeting in-person with them to help you polish your narrative. A total of 3 problem sets will be given. Each problem set is worth 50 points. Each day an assignment is late 10 points will be deducted from the total point value.

Recommended problem sets from the text:

Recommended problem sets from the text book will be provided periodically for the students. Participation is 100% voluntary and the problems will not be graded. It is highly recommended that all of the students work these problems carefully as many of them will resemble the style of questions on the exams.

Exams: Three hourly exams (100 points each) will be given on the dates indicated on the course schedule. The comprehensive final exam will be worth 150 points. The exam formats (i.e. short answer, short essay, problem solving, matching) will be similar to the exams given in past years with the exception that there will more multiple choice questions on the final. I strongly encourage you to work the past years exams and questions at the end of the chapters in the text as part of your exam preparation. Given that a three day window will be available for each exam AND there will be no time limit on the exams, I do not anticipate needing any make-up exams. If you find yourself in **quarantine, please EMAIL ME IMMEDIATELY**. Bring a calculator-no cell phones allowed. Exams will be taken in the USU Testing Center (https://www.usu.edu/testing/). If you are not in Logan for the semester, you will need to seek out an approved testing center within the first 2 weeks of classes.

Assessment Imbedded questions in the final will be used to address if learning objectives are being met.

Grading: **There will be **NO EXTRA CREDIT** awarded in this class.

Critical Thinking /Writing Problem Sets (total of 3 @ 50 pts each)	150 points
On-line quizzes (11, drop lowest)	100 points
Three hourly exams	300 points
Comprehensive Final exam	150 points
Total	**700 points**

General breakdown of grading scale is as follows:

100-90%	A through A-	89.9-80%	B+ though B-
79.9-70%	C+ through C-	69.9-60%	D+ through D-

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in Chem 5710. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.

Class schedule

Week	Day	Date	Lecture	Topic	Chapter, Lehninger 6th ed	Quiz
1	**M**	**1/18**		**NO CLASS**		1
	W	1/20	1	Photosynthesis	19	
	F	1/22	2	Photosynthesis & carbohydrate biosynthesis	19/20	
2	M	1/25	3	Carbohydrate biosynthesis	20	2
	W	1/27	4	Carbohydrate biosynthesis	20	
	F	1/29	5	Lipids	21	
3	M	2/1	6	Lipids	21	3
	W	2/3	7	Lipids In Class Discussion 1	21	
	F	2/5	8	Lipids / Amino acids	21/22	
4	M	2/8	9	Amino acids	22	4
	W	2/10	10	**Critical Problem set #1 DUE** Amino acids	22/23	
	F	2/12	11	Overall metabolism	23	
5	**M**	**2/15**		**NO CLASS**		none
	T-Th	2/16 2/18		**EXAM 1** open from 2/16 to 2/18 at testing center (covers lectures 1-11)		
	W	2/17	12	DNA Technologies	9	
	F	2/19	13	DNA Technologies	9	
6	M	2/22	14	DNA Technologies	9	5
	W	2/24	15	DNA Technologies / Biosignaling	9/12	
	F	2/26	16	Biosignaling	12	
7	M	3/1	17	Biosignaling	12	6
	W	3/3	18	Biosignaling In Class Discussion # 2	12	
	F	3/5	19	Biosignaling	23	
8	M	3/8	20	Biosignaling	23	7
	W	3/10	21	Biosignaling **Critical Problem set #2 DUE**	23	
	F	**3/12**		**NO CLASS**		
9	M-W	3/15-3/17		**EXAM 2** open from 3/16 to 3/18 at testing center (covers lectures 12-21)		none
	M	3/15	22	Genes & Chromosomes	24	
	W	3/17	23	Genes & Chromosomes	24	
	F	3/19	24	DNA metabolism	25	
10	M	3/22	25	DNA metabolism	25	7
	W	3/24	26	DNA metabolism	25	
	F	3/26	27	DNA metabolism	25	
11	M	3/29	28	RNA metabolism	26	8
	W	3/31	29	RNA metabolism	26	
	F	4/2	30	RNA metabolism	26	
12	M	4/5	31	Protein metabolism	27	9

	W	4/7	32	Protein metabolism	27	
	Th	4/8	33	Protein metabolism	27	
	F	**4/9**		**NO CLASS**		
13	M	4/12	34	Protein metabolism/Regulation	27/28	**10**
	W	**4/14**	35	Regulation	28	
	W-F	**4/14-4/16**		**EXAM 3** open from 4/14 to 4/16 at testing center (covers lectures 22-33)		
	F	4/16	36	Regulation	28	
14	M	4/19	37	Regulation	28	**11**
	W	**4/21**	38	Regulation **In Class Discussion # 3**	28	
	F	4/23	39	Review		
15	M	4/26	40	Review **Critical Problem set #3 DUE NOTE usually these are due on Wed**		**none**
FRIDAY		4/30		**FINAL EXAM 9:30-11:20 AM by Proctorio on CANVAS**		

EXPECTATIONS

Much of the raw information in this class you may have seen before, perhaps in another class. However, this is a 5000 level class, which means that you should begin to apply raw information to solve problems.

YOUR JOBS

1) Come to Class Prepared

a) preview slides BEFORE class

b) read the text before or very near lecture time—if time is limited at least look at the subheadings in the chapter and the summarized notes throughout each chapter

2) Understand I am Trying to Prepare You for the Real World

My goals for you are that you are able to intelligently talk about concepts and apply facts/concepts to solve problems.

3) Study Consistently-Don't Cram

a) your objective is not to perform a "data dump" at the end of each exam

b) read the chapter to fill-in/supplement my lectures to provide yourself with a comprehensive view of the material

c) as we move through chapters**, do the suggested questions at the end of the chapter**; answers are at the back

d) as the semester goes along, homework sets and in-class discussions will become more comprehensive—life's problems are not compartmentalized in chapters

e) practice being engaged in class-think about the material we are discussing, ask questions (if you are prepared for class this will be much easier)

MY JOBS

1) Come to Class Prepared

a) highlight the most important concepts in lectures

b) question the class in ways that help students think about concepts specifically (current lecture material) and broadly (over multiple chapter material)

c) inject lectures with examples of how the information is relevant to your careers/lives

2) Provide You with Problems that Develop Your Critical Thinking and Problem Solving Skills

a) make you think within the limits of a technique or concept

b) test your ability to apply the information, not just regurgitate the information

c) show you the relevance of such skills using real-world problems

3) Encourage You to Study Consistently

a) provide weekly quizzes as a way to evaluate your learning

b) provide in-class discussions and research problem sets throughout the semester to evaluate your learning between exams

OBJECTIVES

Using the new IDEA evaluation system, I have identified three main course objectives:

1. Gaining factual knowledge (terminology, classifications, methods, trends)

2. Learning fundamental principles, generalizations, or theories

3. Learning to apply course materials (to improve rational thinking, problem solving and decisions)

Below is a list of how these objectives apply to material throughout the semester:

A. Describe the fundamental components and biochemical reactions that allow an organism to convert light energy into chemical energy **(1,2,3)**

Be able to apply the chemical principles that are the basis for photosynthesis.
Identify the inputs and outputs of the light-dependent and carbon-assimilation pathways.
Know how photosynthetic processes can be regulated and why.
Know the fundamental architecture of carbohydrate-based biomolecules and their role in biology.

B. Describe the biochemical basis for, lipid, nucleic acid, and protein synthesis: cellular location, functions of enzymes, regulation, and function of products **(1,2,3)**

Describe the flux of carbon and nitrogen in living organisms. What are the important enzymes or enzyme complexes?

C. Explain the use of DNA technologies in the research laboratory, the clinic and in industry. Be able to apply molecular biology techniques to solve hypothetical research or human health problems. **(1,2,3)**

D. Develop a comprehensive view of how higher organisms receive and respond to external stimuli at the biochemical level. **(1,2,3)**

Be able to hypothesize how and where a signal is received and what type of biochemical circuitry is used to deliver the message.

E. Describe how mammalian metabolism is integrated as demonstrated by hormonal regulation. **(1,2,3)**

F. Describe the structure and topology of chromosomes and genes and how they are packaged and how this relates to gene expression **(1,2,3)**

Explain how the expression of genetic information is regulated

G. Describe the structure and processes related to DNA, RNA, and protein. **(1,2,3)**

Explain how replication, transcription, translation, and protein processing occur.