ADVANCED BIOCHEMISTRY

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Welcome to CHE/BIO 450, Fall 2019:

Chemistry/Biology 450 is an upper division course cross-listed from the departments of chemistry and biology. This course includes 3 units of Lecture + 1 unit of Lab and is designed to teach the fundamental principles of the chemistry involved in biological processes with an emphasis on protein structure and function. The beauty of biochemistry is that it offers fun and excitement for everyone. If your preferred field is chemistry, this course will help you understand how chemical reactions drive biological processes. If biology is more enjoyable to you, this course will discuss the details of biological systems at the atomic level. The biological application of chemistry is one of my favorite things to talk about and I sincerely look forward to helping you discover the exciting field of biochemistry.

INSTRUCTOR

Ariane Jansma, Ph.D.
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Office Hours: Rohr Science 334
Tues. 8:00 am – 12:00 pm
Wed. 1:30 pm – 2:30 pm
Thurs. 11:00 am – 2:00 pm

SCHEDULE

Lecture, Section 1: MWF	11:00 am – 11:55 am	LA 102
Lecture, Section 2: MWF	12:15 pm – 1:10 pm	LA 102
Lab Section 1: W	2:45 pm – 5:45 pm	ST 221
Lab Section 2: R	8:00 am – 11:00 am	ST 221
Lab Section 3: R	1:30 pm – 4:30 pm	ST 221
Lab Section 4: F	2:45 pm – 5:45 pm	ST 221

REQUIRED TEXT BOOK and RECOMMENDED SUPPLIES

- **Biochemistry, Concepts and Connections,** by Appling (with access to Mastering Chemistry), (ISBN: 9780321839763) **REQUIRED**
- **Composition Notebook,** (NOT SPIRAL BOUND) for lab, **REQUIRED**

- **Sleep,** In order to be successful in this course, it is HIGHLY recommended that you get 8 hours of sleep per night.
- **Lap top computer/iPAD/tablet,** we will be working in teams throughout the semester using the protein visualization software PyMOL
  - Please discuss with your team to ensure there is AT LEAST one device per team for every class
- **PyMOL Software,** you will receive a tutorial the first week of class to help you install the student version of PyMOL (free) on your personal computer

COURSE GOALS and LEARNING OBJECTIVES

At the end of the course, you will be able to:

- Recognize and reproduce the structures of the 20 amino acids
- Apply specific properties of these amino acids to protein folding and activity
- Identify and evaluate enzymatic active sites based on appropriate chemical reactivity
- Apply specific chemical reactions to the processes of metabolism and photosynthesis
- Recognize how and when cells must degrade or apoptosize
- Outline defining mechanisms and lifecycles of several representative viruses

Catalog Description: LECTURE: Detailed analysis of protein and membrane structure. Includes quantitative approaches to the study of enzymes, catalytic mechanisms of enzymes, and a survey of the major metabolic pathways of carbohydrates, lipids, amino acids and nucleic acids. Course includes one three-hour laboratory each week. LAB: An inquiry-based laboratory that is a co-requisite for CHE 450 . Letter graded.

CLASS ATTENDANCE

History has shown that regular attendance is necessary for success in this course. We will spend time in class discussing the material and applying this information to questions which will be covered in the exams. It is definitely in your best interest to attend class. Prior instructor notification via email is necessary for an absence to be excused. Missed assignments can only be made up for full credit for excused absences and students are responsible for all assignments and material covered. Lab attendance is mandatory, unless excused by the professor.

EXAMS

Exams will be held during the lab sections. You may choose which lab section to attend for the exam based on what works best for your schedule.

LECTURE EVALUATION

The activities described above will contribute to your total course grade according to the following:

- Lecture Examinations (3)…… 40%
- Homework Assignments…….. 20%
- Quizzes…….. 20%
- Final Examination…… 20%

LAB EVALUATION

Your laboratory grade is comprised of attendance, participation in weekly projects, keeping a detailed lab notebook and completion of two written laboratory reports.

GRADES

Letter grades will be assigned at the end of the course for both lecture and lab based on your percentage of total possible points, according to the following scale:

	A 93 – 100%	**A-** 90 – 92.9%
B+ 87 – 89.9 %	**B** 83 – 86.9 %	**B-** 80 – 82.9 %
C+ 77 – 79.9 %	**C** 73 – 76.9 %	**C-** 70 – 72.9 %
D+ 67 – 69.9 %	**D** 63 – 66.9 %	**D+** 60 – 62.9 %
F < 59.9 %		

FINAL EXAMINATION POLICY

Successful completion of this class requires taking the final examination **on its scheduled day**. The final examination schedule is posted below as well as the Class Schedules site. No requests for early examinations or alternative days will be approved.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. "Academic dishonesty" is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. See Academic Policies in the undergrad student catalog for definitions of kinds of academic dishonesty and for further policy.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ATTENDANCE and PARTICIPATION POLICY

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If a student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies in the Undergraduate Academic Catalog.

PLNU ACADEMIC ACCOMMODATION

If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by email at DRC@pointloma.edu. See Disability Resource Center for additional information.

CHE/BIO 450 *TENTATIVE* CLASS SCHEDULE

WEEK	DATE	LECTURE TOPICS	CHAPTERS	LAB
Week 1	Tues 09/03	**Administrative Day – NO CLASS**	//////////////////////	**NO LAB**
	Wed 09/04	Welcome to Biochemistry **Pymol Homework Assigned** **Hwk #1 assigned (Mastering)**	Homework: Reading	
	Fri 09/06	**Introduction to Chapters 2 and 3**	5.1	
Week 2	Mon 09/09	**Chapter 5:** Primary Structure	//////////////////////	**Project 1:** Analysis of hemoglobin in ground beef, part 1 of 2
	Wed 09/11	**Chapter 5:** Primary Structure **Pymol Homework due** **Hwk #1 due** **Hwk #2 Assigned**	5.2 – 5.3	
	Fri 09/13	**Chapter 6:** 3-D Protein Structure	6.1 – 6.3	
Week 3	Mon 09/16	**Quiz 1: Amino Acids** **Chapter 6**: 3-D Protein Structure **Hwk #2 Due** **Hwk #3 Assigned**	6.4 – 6.7	**Project 1:** Analysis of Hemoglobin in ground beef, part 2 of 2
	Wed 09/18	**Chapter 7**: Protein Function (Myoglobin/Hemoglobin)	7.8 – 7.10	
	Fri 09/20	**Chapter 7**: Protein Function (Myoglobin/Hemoglobin)	7.9 – 7.12	
Week 4	Mon 09/23	**Quiz 2: Hemoglobin** **Chapter 7:** Protein Function (Myoglobin/Hemoglobin) **Hwk #3 due**	7.13 – 7.15	**Exam 1** **Chap 2/3, 5, 6, and 7**
	Wed 09/25	**Flexible Day**	//////////////////////	
	Fri 09/27	**Chapter 8**: Enzymes **Hwk #4 Assigned (with lecture)**	8.1 – 8.3	
Week 5	Mon 09/30	**Chapter 8**: Enzymes	8.4 – 8.6	**Project 2:** β-Galactosidase Part 1 of 4 **Lab Report #1 (Due 10/04)**
	Wed 10/02	**Chapter 8**: Enzymes	8.7 – 8.9	
	Fri 10/04	**Chapter 10:** Membranes and Cell Transport **Hwk #4 due**	10.4 – 10.4	
Week 6	Mon 10/07	**Quiz 3 (Group), Enzymes** **Chapter 11:** Metabolism **Hwk #5 Assigned**	11.1 – 11.3	**Project 2:** β-Galactosidase Part 2 of 4
	Wed 10/09	**Chapter 11:** Metabolism	11.4 – 11.5	
	Fri 10/11	**Chapter 12:** Glycolysis	12.1 – 12.4	
Week 7	Mon 10/14	**Chapter 12**: Glycolysis **Hwk #5 Due**	12.5 – 12.6	**Exam 2** **Chap 9, 10, 11, 12**
	Wed 10/16	**Flexible Day**	//////////////////////	
	Fri 10/18	**Chapter 12:** Glycolysis	12.7 – 12.8	

Week 8	Mon 10/21	**Chapter 12**: Glycogen metabolism **Hwk #6 Assigned**	12.9	**NO LAB (Fall Break on Friday)**
	Wed 10/23	**Chapter 12:** Glycogen metabolism	12.10	
	Fri 10/25	**Fall Break *Day* – NO CLASS**	//////////////////////	
Week 9	Mon 10/28	**Chapter 13**: Citric Acid Cycle **Hwk #6 Due** **Hwk #7 Assigned**	13.1 – 13.2	**Project 2:** β-Galactosidase Part 3 of 4
	Wed 10/30	**Chapter 13:** Citric Acid Cycle	13.3 – 13.5	
	Fri 11/01	**Chapter 13:** Citric Acid Cycle	13.6 – 13.9	
Week 10	Mon 11/04	**Quiz 4: Glycolysis and TCA** **Chapter 14:** Oxidative Phosphorylation **Hwk #7 Due** **Hwk #8 Assigned**	14.2 – 14.3	**Project 2:** β-Galactosidase Part 4 of 4
	Wed 11/06	**Chapter 14:** Oxidative Phosphorylation	14.4 – 14.5	
	Fri 11/08	**Chapter 14:** Oxidative Phosphorylation	14.5	
Week 11	Mon 11/11	**Chapter 14:** Finish ATP Transport Metabolism Review **Hwk #8 Due**	14.6 – 14.7	**Exam 3 Chap 12.7 – 15.3**
	Wed 11/13	**Flexible Day**	//////////////////////	
	Fri 11/15	**Chapter 15:** Photosynthesis (Light Reactions)	15.1 – 15.3	
Week 12	Mon 11/18	**Chapter 15:** Photosynthesis (Dark Reactions) **Hwk #9 Assigned**	15.4 – 15.5	**Project 3:** Hexokinase activity, Part 1 of 2 **Lab Report #2 due (11/22)**
	Wed 11/20	**Chapter 15: C_4 cycle**	15.6	
	Fri 11/22	**Quiz 5 (Group): Photosynthesis** **Chapter 16:** Lipid Metabolism	16.1 – 16.2	
Week 13	Mon 11/25	**Chapter 18**: Amino Acid Metabolism Protein Degradation **Hwk #9 Due**	18.1 – 18.3	**NO LAB**
	Wed 11/27	**Thanksgiving Recess – NO CLASS**	//////////////////////	
	Fri 11/29	**Thanksgiving Recess – NO CLASS**	//////////////////////	
Week 14	Mon 12/02	**Chapter 18:** Amino Acid Metabolism Apoptosis	18.4 – 18.5	**Project 3:** Hexokinase activity, Part 2 of 2
	Wed 12/04	Oncogenesis I	Handout	
	Fri 12/06	Oncogenesis II Introduction to Viruses	Handout	
Week 15	Mon 12/09	Viruses II	Handout	**Lab wrap up** **Notebooks due in lab** **Report #3 due (12/13)**
	Wed 12/11	Viruses III	Handout	
	Fri 12/13	**Flexible Day**	//////////////////////	
Week 16	Mon 12/16	**NO CLASS, Happy Holidays!**	//////////////////////	**Final Exam (Multiple Choice)**
	Wed 12/18	**FINAL EXAM** **4:30pm, Location TBA**	//////////////////////	
	Fri 12/20	**NO CLASS, Happy Holidays!**	//////////////////////	