

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 2017:

Chemistry/Biology 450 is an upper division course (4 units) designed to teach the fundamental principles of the chemistry involved in biological processes. 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. Regardless of which field you prefer, I encourage you throughout this semester to read thoroughly, apply reading material to activities designed for practice and ask as many questions as necessary in order to succeed. Ultimately, the biological application of chemistry is one of my favorite things to talk about. I am happy you are here. I look forward to helping you discover the exciting field of biochemistry.

INSTRUCTOR

Ariane Jansma, Ph.D.

Office: Rohr Science, 305D

Phone: 619-849-2623

Email: ajansma@pointloma.edu

<https://canvas.pointloma.edu/>

Office Hours: BY APPOINTMENT

Tues/Thurs. 9:00 am – 12:00 pm

Wed./Fri. 9:00 am – 10:00 am

See Canvas Module for Details

SCHEDULE

| | | |
|-------------------------|---------------------|------------|
| Lecture, Section 1: MWF | 11:00 am – 12:05 pm | Taylor 312 |
| Lecture, Section 2: MWF | 12:15 pm – 1:20 pm | Taylor 312 |
| Lab Section 1: T | 6:30 pm – 9:30 pm | ST 221 |
| Lab Section 2: W | 6:00 pm – 9:00 pm | ST 221 |
| Lab Section 3: R | 8:00 am – 11:00 am | ST 221 |

REQUIRED TEXT BOOK and SUPPLIES

- **Biochemistry, Concepts and Connections**, by Appling (with access to Mastering Chemistry), (ISBN: 9780321839763)
Required
- **iClicker**: Used to moderate group activities and to take attendance
Required

RECOMMENDED SUPPLIES

- Lap top computer – we will be working in teams throughout the semester using the protein visualization software PyMOL
 - Please discuss with your team to ensure there is one lap top 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 computers

COURSE GOALS and LEARNING OBJECTIVES

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

- Recognize 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
- Recognize how and when cells must degrade specific proteins
- Outline defining mechanisms and lifecycles of several representative viruses

Catalog Description: 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.

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.

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. Exams during lab time serve two purposes. First, this provides sufficient time to use the lecture corresponding to an exam day as a review session. Second, because this course covers such an extensive amount of material, this will provide sufficient time to allow 2 hours to complete the exam.

EVALUATION

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

- | | |
|--|-----|
| • Lecture Examinations (3)..... | 30% |
| • Homework Assignments..... | 15% |
| • RATs, Quizzes and Participation..... | 20% |
| • Laboratory..... | 20% |
| • Final Examination..... | 15% |

GRADES

Letter grades will be assigned at the end of the course 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 08/29 | Welcome to Biochemistry Pymol Homework Assigned | //////////////////// | NO LAB |
| | Wed 08/30 | Introduction to Chapters 2 and 3 | Homework: Reading | |
| | Fri 09/01 | Chapter 5: Primary Structure | 5.1 | |
| Week 2 | Mon 09/04 | LABOR DAY – No Class | //////////////////// | Myoglobin Extraction |
| | Wed 09/06 | Chapter 5: Primary Structure Pymol assignment due by 5pm | 5.2 – 5.3 | |
| | Fri 09/08 | Chapter 6: 3-D Protein Structure Chapter 2 and 3 Homework due by 5pm | 6.1 – 6.3 | |
| Week 3 | Mon 09/11 | Amino Acid Quiz Chapter 6: 3-D Protein Structure | 6.4 – 6.7 | Analysis of Myoglobin Extraction (go through lab report rubric) |
| | Wed 09/13 | Chapter 7: Protein Function | 7.8 – 7.10 | |
| | Fri 09/15 | Chapter 7: Protein Function | 7.9 – 7.12 | |
| Week 4 | Mon 09/18 | Chapter 7: Protein Function | 7.13 – 7.15 | Exam 1 Chap 2/3, 5, 6, and 7 |
| | Wed 09/20 | Review Session, Chap 2, 3, 5, 7 | //////////////////// | |
| | Fri 09/22 | Chapter 8: Enzymes | 8.1 – 8.3 | |
| Week 5 | Mon 09/25 | Chapter 8: Enzymes | 8.4 – 8.6 | β -Galactosidase Part 1 of 5 Lab Report 1 Due 9/29, 5pm |
| | Wed 09/27 | Chapter 8: Enzymes | 8.7 – 8.9 | |
| | Fri 09/29 | Chapter 10: Membranes and Cell Transport | 10.4 – 10.4 | |
| Week 6 | Mon 10/02 | Quiz 2, Enzymes Chapter 11: Metabolism | 11.1 – 11.3 | β -Galactosidase Part 2 of 5 |
| | Wed 10/04 | Chapter 11: Metabolism | 11.4 – 11.5 | |
| | Fri 10/06 | Chapter 12: Glycolysis | 12.1 – 12.4 | |
| Week 7 | Mon 10/9 | Chapter 12: Glycolysis | 12.5 – 12.6 | Exam 2 Chap 9, 10, 11, 12 |
| | Wed 10/11 | Review Session, Chap 8, 10, 11, 12 | //////////////////// | |
| | Fri 10/13 | Chapter 12: Glycogen metabolism (Dr. Koudelka) | 12.7 – 12.8 | |
| Week 8 | Mon 10/16 | Chapter 12: Glycogen metabolism (Dr. Koudelka) | 12.9 | NO LAB |
| | Wed 10/18 | Chapter 12: Glycogen metabolism | 12.10 | |
| | Fri 10/20 | Fall Break Day – NO CLASS | //////////////////// | |
| Week 9 | Mon 10/23 | Chapter 13: Citric Acid Cycle | 13.1 – 13.2 | β -Galactosidase Part 3 of 5 |
| | Wed 10/25 | Chapter 13: Citric Acid Cycle | 13.3 – 13.5 | |

| | | | | |
|-------------|-------------|--|----------------------|--|
| | Fri 10/27 | Chapter 13: Citric Acid Cycle | 13.6 – 13.9 | |
| Week | Date | Lecture Topic | Chapters | Lab |
| Week 10 | Mon 10/30 | Quiz of Glycolysis and TCA Structures Chapter 14: Oxidative Phosphorylation | 14.2 – 14.3 | β-Galactosidase Part 4 of 5 |
| | Wed 11/01 | Chapter 14: Oxidative Phosphorylation | 14.4 – 14.5 | |
| | Fri 11/03 | Chapter 14: Oxidative Phosphorylation | 14.5 | |
| Week 11 | Mon 11/06 | Chapter 14: Finish ATP Transport Metabolism Review | 14.6 – 14.7 | Exam 3 Chap 12.7 – 15.3 |
| | Wed 11/08 | Review Session, Chap 12.7 – 15.3 | //////////////////// | |
| | Fri 11/10 | Chapter 15: Photosynthesis (Light Reactions) | 15.1 – 15.3 | |
| Week 12 | Mon 11/13 | Chapter 15: Photosynthesis (Dark Reactions) | 15.4 – 15.5 | β-Galactosidase Part 5 of 5 |
| | Wed 11/15 | Chapter 15: C₄ cycle | 15.6 | |
| | Fri 11/17 | Chapter 16: Lipid Metabolism | 16.1 – 16.2 | |
| Week 13 | Mon 11/20 | Chapter 18: Amino Acid Metabolism Protein Degradation | 18.1 – 18.3 | NO LAB |
| | Wed 11/22 | Thanksgiving Recess – NO CLASS | //////////////////// | |
| | Fri 11/24 | Thanksgiving Recess – NO CLASS | //////////////////// | |
| Week 14 | Mon 11/27 | Chapter 18: Amino Acid Metabolism Apoptosis | 18.4 – 18.5 | <i>V. Fischeri</i> Part 1 of 2 Lab report due (10% E.C), 12/2 |
| | Wed 11/29 | Oncogenesis I | Handout | |
| | Fri 12/01 | Oncogenesis II Introduction to Viruses | Handout | |
| Week 15 | Mon 12/04 | Viruses II (Dr. Koudelka) | Handout | <i>V. Fischeri</i> Part 2 of 2 (quick analysis) Finish Notebooks and have TA sign off (due at office by 12/08) Lab report due (5% E.C), 12/5 Lab report due 12/09 |
| | Wed 12/06 | Viruses III | Handout | |
| | Fri 12/08 | Final Review Session | //////////////////// | |
| Week 16 | Mon 12/11 | NO CLASS | //////////////////// | Final Exam (Multiple Choice) |
| | Wed 12/13 | Final Exam, ALL SECTIONS 4:30 – 7:00 pm | //////////////////// | |
| | Fri 12/15 | NO CLASS | //////////////////// | |