

## **CHEM525: Biochemistry Laboratory Techniques Sections 001, 002, 003 (Fall 2015)**

### **Instructor:**

Dr. Jason C. Hurlbert

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### **Meeting Times:**

**All Sections:** Prelab Lecture Mondays, 12:30 - 1:20 PM or Mondays, 5:00 – 5:50 PM

**Section 001 :** Laboratory Tuesdays, 2:00 - 4:50 PM

**Section 002 :** Laboratory Wednesdays, 2:00 - 4:50 PM

**Section 003:** Laboratory Thursdays, 2:00 – 4:50 PM

**Credit Hours:** 2

**Textbook:** None. Handouts and Scientific articles are provided on the website.

**Required Materials:** Scientific calculator, laboratory notebook, safety goggles, Sharpie extra fine point waterproof marker

### **Course Goals and Objectives**

We will cover recombinant protein production and purification, enzymological analysis and the solution structure of enzymes in several experiments over the course of the semester. As we perform the experiments, I hope you will gain an appreciation of the various techniques performed in modern biochemical research.

### **Student Learning Outcomes**

Upon the completion of this course, students will:

- 1) Be able to perform routine biochemical laboratory techniques and operate instrumentation found in any biochemistry modern laboratory
- 2) Know how to statistically validate and interpret data obtained from experimentation
- 3) Utilize modern bioinformatics software in the study of biological molecules
- 4) Be able to better read, write and interpret scientific research articles
- 5) Understand how to organize experimental results multiple experimental methods to thoroughly dissect a single biochemical problem

These learning outcomes mesh well with the four University Level Competencies (ULCs) that describe the skills Winthrop faculty have outlined for students to develop during their tenure here. These include:

### **Competency 1: Winthrop graduates think critically and solve problems.**

You will be regularly tested on your abilities to read, interpret and apply information that ties together biology, general, organic and physical chemistries as they apply to life's processes. Many of the lab assignments require you to read and interpret current biochemical literature and use modern scientific software to visualize biological

macromolecules. These tasks will help hone your ability to cross-tie information and apply lessons and ideas from one specific case to another.

**Competency 2: Winthrop graduates are personally and socially responsible.**

You will be expected to work with others in the class, while striving to complete assignments individually and with your own personal interpretations.

**Competency 3: Winthrop graduates understand the interconnected nature of the world and the time in which they live.**

Biochemistry is an interdisciplinary science and during this course you will realize the interdependence of biology, physics and chemistry. You will gain an appreciation of how each field can be interpreted in terms from the others.

**Competency 4: Winthrop graduates communicate effectively.**

A major portion of your grade in this course will come from summarizing your work into a manuscript that could be submitted for publication to the Journal of Biological Chemistry or Biochemistry. During the semester, you will be expected to learn how to write in a manner fit for scientific journals and a large part of that will be learning how to edit your own work. Many of the assignments will have rough drafts that will require you to schedule a time to read your work out loud to me and in so doing, catch your own errors in sentence construction, grammar and overall paper design / thought layout.

**Course Requirements / Grading for the Course**

**Prelab Assignments:**

Due to the tight schedule we will follow during the semester, your prelab assignments must be completed and turned in before you may begin work on your scheduled laboratory session. This requirement is necessary to ensure that you will be able to perform the myriad tasks that need to be accomplished in the laboratory each week. **Failure to complete the prelab assignments AND bring the completed work to class with you will result in you being barred from the lab for the week.** This will, in turn, result in you not being able to complete the assigned work and being unable to complete the Section Writeup which will seriously lower your overall grade.

**Section Writeups**

Four different section writeups will be due during the semester. These writeups will be due at the start of the lab period indicated on the detailed course schedule. Each weekly writeup must include the following sections: 1) Materials and Methods, 2) Results and Discussion, 3) Conclusions and 4) References. The Results and Discussion section will contain all necessary Figures and Tables in addition to scientific explanations of the data. All Figures and Tables must be prepared in accordance to the guidelines provided to authors in the Journal of Biological Chemistry ([www.jbc.org](http://www.jbc.org)).

**Final Report**

A final report will be due on the last day of the semester (December 8). This report will be a compilation of the corrected section writeups you turned in during the semester with

Abstract and Introduction sections. The entire report must be formatted in the style of an article from the Journal of Biological Chemistry. Despite the fact that much of the material will already be written, you will need to construct a laboratory report that is coherent, logical and accurately describes what you have done during the semester.

### **Laboratory Notebook**

A laboratory notebook is one of most important tools a scientist has and is just as important in this class. You must carefully document all of the procedures and reagents you use as well as the data you collect during the semester. Any of your peers should be able to pick up your lab notebook and be able to reproduce what you did without any problem. Keep this in mind should you have any questions about what you should enter into your notebook. We will discuss how to properly keep a notebook in the first recitation session and examples will be provided.

### **Late Work**

There are very few acceptable excuses for late work and the most common one offered by students: "I didn't have time", is not one of them. Failure to plan ahead and complete the assignments on time is no one's fault but your own. Should problems arise with the experiments, you will be provided data that will allow you to complete the assignments on time. Should you have difficulties in completing an assignment, you are expected to come to the instructor as early and as often as necessary so that you understand the assignment and can perform your very best work. ***No Late assignments will be accepted.*** The only exceptions to this rule are documented medical and legal absences or excused absences for athletic competitions. **All due dates are given on the Detailed Schedule page on the course website and you are expected to plan accordingly.** Please, budget your time and just come see me if any problems arise. I will work with each of you on a case-by-case basis to be certain that you achieve the goals laid out for you for the course.

### **Final Exam**

A cumulative final exam will be given on the final week of the semester and it will cover the background material, theories and practices covered during the semester.

### **Final Grade**

Prelab Assignments: 9 x 10 pts = 90 points

Section Writeups: 4 x 30 pts = 120 points

Homework Assignments: 1 x 20 pts = 20 points

Final Paper: 50 points

Laboratory Notebook: 40 points

Final Exam: 30 points Total: 350 points

### **Grading Scale:**

A: >90% of the total Points

B+: 87 - 89.9% of the total Points, B: 80 - 86% of the total Points

C+: 77 - 79.9% of the total Points, C: 70 - 76.9% of the total Points

D: 60 - 69.9% of the total Points

F: <60% of the total Points

### Tentative Course Schedule

Week of	Topic	Assignment Due
Monday, Aug 24	<b>No Class</b>	
Aug 31	Course Introduction	---
Sept 7	<b>No Class</b>	
Sept 14	Practical Bioinformatics: Looking AND Seeing with Entrez/BLAST and Chimera	
Sept 21	Protein Expression and Purification: Cell Lysis	Entrez / BLAST and Chimera Homework assignments due (Homework 1)
Sept 28	Protein Expression and Purification: FPLC: Ion Exchange Chromatography	
Oct 5	Analysis of Protein Purification: SDS-PAGE and Western Blot	Rough Draft (Handwritten text!) of Introduction due
Oct 12	Analysis of Polymer Depolymerization Kinetics by reversed phase HPLC	Rough Draft (Handwritten text!) of Protein Purification and SDS-PAGE/Western Blot Writeup Due
Oct 19	<b>No Class</b>	
Oct 26	Kinetics I: Influence of [Substrate] on enzymatic reactions	Protein Purification and SDS-PAGE/Western Blot Writeup due (Writeup 1)
Nov 2	Kinetics II: Influence of pH on enzymatic reactions	HPLC Kinetics Writeup due (Writeup 2)
Nov 9	Kinetics III: Chemical Denaturation of Proteins	
Nov 16	Probing tertiary structure by limited proteolysis, mass spectrometry and bioinformatics	Rough Draft (Handwritten text!) of Kinetics I, II and III Writeup due
Nov 24	<b>Thanksgiving Break – Prelabs Meet But No Lab Sessions</b>	Kinetics I, II and III Writeup due (Writeup 3)
Nov 30	Final Exam During Prelab Session	Mass Spectrometry Writeup due (Writeup 4) during Prelab Session
Dec 7	<b>Final Report Due at 5:00 PM</b>	

#### Students taking the course for graduate credit

Any student taking the course for graduate credit will be required to prepare a final presentation (20 minutes) summarizing the experimental results from the semester. This presentation must clearly introduce the family of enzymes under study in the class, describe the theoretical basis of each of the experiments performed and clearly discuss and interpret the results. This presentation will count as 20% of the final grade

**Technology in the Classroom**

You will need to make certain that you bring a scientific calculator to the lab each session, and, more importantly, you must know how to use the linear regression mode of your calculator. No laptop computers or cellular phones may be used in the laboratory when class is meeting as the distractions they cause present a significant safety hazard. Anyone caught using these devices during class without prior permission will immediately be asked to leave for the day and will not be allowed to make up the laboratory work they miss as a result of their actions.

**Drop Policy:** As described in the Winthrop University Undergraduate catalog

**Student code of conduct**

As noted in the Student Conduct Code: “Responsibility for good conduct rests with students as adult individuals.” The policy on student academic misconduct is outlined in the “Student Conduct Code Academic Misconduct Policy” in the online *Student Handbook* (<http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf>).

**Students with Disabilities**

Winthrop University is dedicated to providing access to education. If you have a disability and require specific accommodations to complete this course, contact the Office of Disability Services (ODS) at 323-3290. Once you have your official notice of accommodations from the Office of Disability Services, please inform me as early as possible in the semester.