

## CHE 4350 Biochemistry Laboratory

Spring 2017

Tuesday, 1-4:50pm, Room 3099

Instructor: Dr. Megan E. Filbin-Wong

Office Hours: M/W 10-11:30a, T 11a-12p, or by appointment

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(please put CHE 4350 in e-mail subject line)

### Why is this Course Awesome?

All of the action in biochemistry is in the lab! Sure, learning about what makes blood red or why ATP/GTP are so central to metabolism is cool, but how did we figure that out...? Biochemists learn and discover by experimenting. Learning how to design and carry out an experiment and analyze the results is central to your education as budding chemists/biochemists, medical professionals, teachers...etc. The critical thinking, observation and analytical skills you learn in the course can be utilized in any career you choose.

Modules 1 and 2 of this course are designed to give you expected results so that you can learn how to use the equipment, design specific assays and become comfortable in the biochemistry laboratory. Module 3 is designed to test what you learned in Modules 1-2, and how you can *apply* that knowledge toward designing an independent project. Keep in mind that experimentation pretty much never works out perfectly. It is up to you to take your time and diligently carry out each protocol. Yet, even in doing so, you may run into "hurdles." That's okay! The point is that you understand the cause of those hurdles and *learn* from them. If you find that you are truly struggling, plan on coming to my office hours for additional help. Remember, in this course you are learning how to think like a biochemist and basic techniques that almost every biochemist uses in his/her career. Lastly, I fully expect that you adhere to the safety measures outlined in your laboratory manual and those we discuss during the course meeting. Safety is not to be taken lightly – be cautious and aware of your actions and of those around you throughout the course – and no one will lose an appendage.

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### Required Materials

- 1) Biochemistry Laboratory Manual, Bonham, A., Ragan, E., Drotar, A., Elkins, K. and Filbin-Wong, M.E. Chemistry Department, Metropolitan State University of Denver, Denver, CO. 2015. (Available for download from Blackboard).
- 2) Biochemistry Laboratory, Modern Theory and Techniques, Boyer, R. 2<sup>nd</sup> Ed. Prentice Hall, Inc. 2012. ISBN-10: 013604302X, ISBN-13: 978-0136043027
- 3) Lab notebook (does NOT need to be carbon-copy). Preferably a NEW notebook, or only *partially* used.
- 4) Scientific or graphing calculator (no cell phones, laptops, tablets or any other tech-savvy devices, please).

### Participation

You simply cannot conduct any fruitful experimentation if you do not put the time in the laboratory. Your participation will be graded, particularly in second half of the semester during the independent projects, as it is expected that you show up each course meeting and work with your lab partner(s) to design a project and conduct the necessary assays to test your hypothesis. Your participation is worth 5% of your grade (see below).

### Lab Notebooks

Lab notebooks are essential to ALL experimentation. You are expected to clearly write in your lab notebook each week, following the format in the lab manual. While your lab notebook may seem tedious and pointless, if experiments cannot be repeated based on the way they were recorded, they are often dismissed. So, it behooves you to be diligent and professional when keeping a lab notebook. Your lab notebook is also a significant portion (10%) of your grade (see below).

### Quizzes

Quizzes will be given at the beginning of each course meeting for Modules 1 and 2. Each quiz will consist of five questions about the material to be covered that day. So, in order to do well on the quizzes, it is essential you read the lab manual and any accompanying material before class. I strongly encourage you to complete the pre-lab questions in

the manual to prepare for the quizzes each week. There will be 6 quizzes this semester and no make-up quizzes. If you miss a class or are tardy, you will receive a zero. To compensate, your lowest quiz grade will be dropped (see grading below). If you miss a lab/quiz, you are still responsible for the content covered in your absence! Quizzes constitute 10% of your grade, so be sure to prepare for each course meeting. *If you are caught looking at someone's paper, using any devices besides a scientific/graphing calculator, or in any way cheating, you will receive a zero on the quiz.*

### **Blog Entries**

Throughout Module 3 you will be expected to blog about your experience working in the biochemistry lab and testing your hypothesis. Your blog is expected to be posted on Blackboard after each course meeting on the weeks of 10-13, prior to the next course meeting. For more information about how to construct your blog, please refer to the lab manual. Four blog entries of at least five sentences will be worth 5% of your grade.

### **Lab Reports**

There will be three lab reports during the semester. You will have two weeks to complete each lab report following modules 1 and 2, and several weeks to write the lab report for your final project. All reports must be typed and the data analyzed using Xcel or equivalent program (use the best fit line function to calculate slope when graphing data points). Each report should be concise (science writing is direct, relevant and clear – not “flowery”), well organized and should follow the ACS Biochemistry format (see Appendix of Biochemistry Laboratory Manual). Numerical data should not be rounded; data should be exact and significant (i.e. follow the rules of significant figures).

Your lab report should be *entirely* your own. Group work in lab does not equate to equivalent reports. That is considered plagiarism. You are encouraged to include any ideas you may receive from reading journal articles/textbook on these topics, however make sure you cite your source. Take these reports seriously; they constitute 40% of your total grade. Each day lab reports are late, 5% of your grade for that report will be deducted. Lab reports more than seven days late will not be accepted.

### **Group Presentations**

You will be required to present information about your independent project TWICE: one presentation (during week 10) will outline your project idea and plans to test your hypothesis (idea presentation, worth 10% of your grade). During the last regular course meeting, you will be expected to present the results of your research (final presentation, worth 20% of your grade). Presentations should be approximately 10 minutes long (10-15 slides) with the presentation duties doled out equally between group members (please see lab manual for more information). The presentations constitute 30% of your overall grade.

### **Specific, Measurable Student Behavioral Learning Objectives**

Upon completion of this course, the student should be able to:

- 1) Prepare a buffer and perform buffer calculations
- 2) Isolate plasmid DNA, run PCR reaction and agarose gel electrophoresis
- 3) Use online resources to find information about a DNA sequence (ex. BLAST search)
- 4) Identify three recombinant proteins and describe their importance in human health or wellbeing
- 5) Purify a protein using one or more chromatography steps and run SDS-polyacrylamide gel electrophoresis
- 6) Experimentally determine the catalytic constants for an enzyme using kinetic techniques

## Grade Calculation

If you have at least 90.0% you have earned an A. The cutoffs for the other scores are: 89.9-80.0% (B), 79.9-70.0% (C), 69.9-60.0% (D), and less than 60% will be an F.

### Modules 1-2

Lab Notebooks (6/7 entries counted toward grade)	5
Quizzes (5/6 counted toward grade)	10
2 Lab Reports	20

### Independent Project

Participation (attendance)	5
Lab Notebook (independent project notes)	5
Blog Entries	5
Idea Presentation	10
Final Presentation	20
Lab Report (final report)	20
<b>Total</b>	<b>100%</b>

*Percentages are tentative and subject to change by the instructor.*

*If you are caught plagiarizing any assignment or in any way committing academic dishonesty (fabrication, helping others cheat, etc.), you will receive an automatic F on that assignment. Repeat offenders may face a permanent F for the course, at the discretion of the instructor.*

Please keep track of your grades throughout the semester. If you are struggling to determine exactly what your grade is, please come to my office hours or schedule an appointment to see me in person. Exam grades will generally be available at the next regularly-scheduled course meeting. Final grades will be available by web and kiosk on May 19<sup>th</sup> at <http://connectu.msudenver.edu>. **The Family Educational Rights and Privacy Act prohibit me from releasing your grades via phone or email unless you register with the Registrar's office and obtain a non-identifying security code.**

## MSU Denver College of Letters, Arts & Sciences Administrative Policies

For information regarding withdrawals, incompletes, academic integrity, sexual misconduct, accommodations to assist individuals with disabilities, attendance on religious holidays, electronic communication and Fresh Start, please see "CLAS Administrative Policies" in Blackboard, or please visit:

[http://www.msudenver.edu/media/content/departmentofchemistry/CLAS\\_Syllabus\\_Policies\\_Spring\\_2017.pdf](http://www.msudenver.edu/media/content/departmentofchemistry/CLAS_Syllabus_Policies_Spring_2017.pdf)

## Syllabus Changes & Policy

Any changes in this syllabus I may deem necessary during the semester will be announced in class and made available in writing. I reserve the right to revise the syllabus and grading policies at any time.

Week	Dates	Topic	Quiz	What's Due?
<b>Module 1: Biochemistry Laboratory Basic Skills &amp; DNA Technologies</b>				
1	01/17	Introduction Pipetting & Buffers	--	
2	01/24	DNA Purification of Plasmid DNA and PCR	Plasmids & PCR	
3	01/31	Agarose Gel Electrophoresis & Bacterial Transformation	Electrophoresis & Transformation	<b>Start Thinking – I.D. Projects!!</b>
4	02/07	Plasmid Prep, Restriction Digest & Electrophoresis	Restriction Digestion	<b>Report Peer-Review (in class)</b>
<b>Module 2: Protein Purification &amp; Characterization</b>				
5	02/14	Nickel Affinity Column Chromatography	Chromatography	<b>Report Peer-Review (in class)</b>
6	02/21	UV-Vis, Bradford Assays & SDS- PAGE	Spectroscopy	<b>Mod 1 Reports Due</b>
7	02/28	Tyrosinase Kinetics	Measuring Kinetics	<b>Project Proposal to Instructor Due</b>
<b>Module 3: Independent Biochemistry Projects</b>				
8	03/07	Independent Project Planning/Discussing	--	<b>List of Supplies Due</b>
9	03/14	Project Idea Presentations, Gathering Supplies	--	<b>Mod 2 Reports Due</b>
10	<b>Spring Break!!! ☺</b>			
10	03/28	Projects in Progress, Blog Entries	--	<b>Blog 1</b>
11	04/04	Projects in Progress, Blog Entries	--	<b>Blog 2</b>
12	04/11	Projects in Progress, Review Progress with Instructor	--	<b>Blog 3</b>
13	04/18	Projects in Progress, Blog Entries	--	<b>Blog 4</b>
15	04/25	Presentation Review/Last Minute Experiments	--	
16	05/02	Class Presentations & Lab Clean- Up	--	<b>Final Presentation Mod 3 Reports Due</b>
FINAL	05/09	You're Done! Good Luck with Final Exams!!		