

Tuesday & Thursday, 10:00-11:50a, Location SI 3079

**Instructor:** Dr. Megan E. Filbin-Wong

**Contact:** [mfilbin1@msudenver.edu](mailto:mfilbin1@msudenver.edu)

(please put CHE 4310 in e-mail subject line)

**Office Hours:** M 10:00a-1:00p, T 12:00-2:00p or by appointment

**Office:** SI 3055 (or my lab, SI 3097)

### What Makes This Course Awesome?

Biochemistry is the chemistry of life. In this course, you will learn how to apply what you learned in General Chemistry and Organic Chemistry to processes that occur in living organisms. You will gain in-depth understanding of the biomolecules our bodies use for structure, replication and the mechanisms by which we use fuel for energy. We will also explore the molecular and biochemical basis for various disease states, genetic mutations and metabolic problems that arise when systems are disrupted.

### What Is Expected of You?

There are multiple layers of complexity in the field of biochemistry as it meshes biology with chemistry. In doing so, there are expectations you must take away to learn and succeed in this course:

- 1) Regular Attendance & Daily Studying – Lectures are an important part of learning biochemistry. Sure, the book does a pretty good job at explaining topics, but nothing takes away from open discussion during the biweekly lectures. Also, you will likely not grasp everything after listening to my lectures and you certainly need to practice the vocabulary and problem sets outside of lecture. Daily practice by reading the assigned chapters and doing the practice problems will help you not only pass the course, but also master the topics presented that you will need for future careers.
- 2) Schedule Your Time Accordingly – Please plan your schedule around the assigned homework sets, mid-term exams and final exam. I expect *at least* two weeks notification for any exam you may miss and there will not be any flexibility on the date and time of the final exam. Review the schedule now and make sure you have set aside the time necessary to complete this course.
- 3) Apply Yourself & Work Through Problems – Showing up to lectures, nodding your head without paying much attention and quickly going over practice problems (e.g. reading the problem and the answer without working through the problem) is easy. When the exams roll around, you will likely find yourself struggling to answer questions. However, if you actively take notes and participate during lecture, and challenge yourself to complete the practice problems, you will succeed. If you find that you are truly struggling, plan on coming to my office hours for additional help (see below).

### What Can You Expect from the Instructor?

I will give clear and on-time lectures, define your learning objectives for each topic and encourage class participation throughout the course. Your assignments will cover the material you are expected to understand and I will grade homework sets and quizzes fairly as outlined below. If you are unable to see me during my office hours, I will be flexible with my time to ensure your questions are answered and your concerns are addressed. Lastly, I hope that through my own excitement you all will learn just how amazing biochemistry can be!!

### Required Materials

- 1) Biochemistry: Concepts and Connections, Appling, D.R., Anthony-Cahill, S.J & Mathews, C.K.  
ISBN-13: 978-0-321-83992-3  
ISBN-10: 0-321-83992-7
- 2) Scientific or Graphing Calculator for practice problems, homework and exams (no cell phones, laptops, tablets or other savvy devices are allowed during exams).
- 3) Sapling Learning Subscription (<http://www.saplinglearning.com>). Instructions available below.
- 4) Materials for note taking (either a notebook or printed PowerPoint Slides).
- 5) iClickers (provided for you at the beginning of each lecture).

## Pre-Lecture Knowledge Assessment

Understanding biochemistry requires basic knowledge of general and organic chemistry concepts. If it has been a while since your last chemistry class, you may struggle with keeping up in lecture. In order to facilitate higher-level lectures and to be sure everyone is “on the same page”, a pre-lecture assessment of your basic chemistry knowledge will be provided for you on Blackboard Learn. Treat this assignment as a way to assess your understanding/memory of basic chemical concepts – and your opportunity to review concepts so you do not get lost in lecture. **While you will not be graded on these assessments, you are encouraged to complete them before each new lecture. Answers to each assessment will be provided at noon on the day of the corresponding lecture.**

## Practice Worksheets

To provide additional practice and application of your knowledge for topics we discuss in class, practice worksheets will be posted on Blackboard. Answers to these worksheets will only be provided in person, so be sure to bring your completed worksheet to either class or office hours. **Like the pre-lecture knowledge assessments, you will not be graded for these worksheets; they are provided to you as additional practice.** However, you are encouraged to use them to test your understanding and study for exams.

## Class Participation / iClickers

Attending and participating during lectures is an essential part of learning biochemistry. Throughout the semester, we will have multiple in-class group discussions and problem solving sets. You will have assigned iClickers to answer problem sets (I will provide iClickers each course meeting) to the best of your ability, followed by group discussions to facilitate learning. Importantly, these questions will challenge you to work together to solve complex biochemical problems. **Your participation in these discussions, including your answers to iClicker questions will constitute 2 % extra credit to your overall grade at the end of the semester (equivalent to raising one exam by approximately one letter grade).**

## Homework

There is no way to get around practicing and solving problems when learning biochemistry. While doing the online homework is important for your grade, completing the suggested problems in each chapter of your textbook will give you more practice at solving important biochemical questions. **Registering and completing the online homework through Sapling Learning will constitute 10 % of you overall grade.** I strongly encourage you to complete the homework assignments throughout the semester to aid in your understanding prior to exams, however all homework assignments are due by May 4<sup>th</sup> at 11:55 P.M. There is *no* opportunity for an extension or extra credit for homework.

## Exams

Exams will be given approximately triweekly (see schedule below). Reviews with study questions will be provided before each exam. A total of four exams will consist of approximately 25-30 short answer / calculation / structure and/or multiple-choice questions. Exams will cover the material stated on the schedule (2-3 chapters/exam) and will be given during the full course meeting (~ 2 hours) during a Tuesday course meeting. Make-up exams will not be given on a routine basis and are strictly the decision of the instructor. **Exams are worth 70 % of your overall grade, your lowest exam grade will be dropped (we all have bad days).**

## Final Exam

Your final exam will be similar to the American Chemical Society standardized Biochemistry Exam. The final is required for all students and will be given during finals week in May (05/08 or 05/10, TBA). **It is worth 20 % of your overall grade.**

## Grade Calculation

If you have at least 92.0% you have earned an A. The cutoffs for the other scores are: 90-91.9% (A-), 88-89.9% (B+), 82-87.9% (B), 80-81.9% (B-), 78-79.9% (C+), 72-77.9% (C), 70-71.9% (C-), 68-69.9% (D+), 62-67.9% (D), 60-61.9% (D-), and less than 60% will be an F.

Sapling Homework	10
4 Exams (lowest dropped)	70
Final Exam	20
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Total	100 %

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

*If you are caught cheating on any assignment or in any way committing academic dishonesty (plagiarizing, 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. Quiz grades will be available at the next regularly-scheduled course meeting. Final grades will be available by web and kiosk on May 18<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 the CLAS Policies posted on Blackboard or visit:

[https://msudenver.edu/media/content/departmentofchemistry/CLAS\\_Syllabus\\_Policies\\_Spring\\_2018..pdf](https://msudenver.edu/media/content/departmentofchemistry/CLAS_Syllabus_Policies_Spring_2018..pdf)

## Registering for Sapling Learning

- 1) Go to <http://saplinglearning.com> and click on "US Higher Ed" at the top right.
- 2) If you already have a Sapling Learning account, log in and skip to step 5.
- 3) If you have Facebook account, you can use it to quickly create a Sapling Learning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and time zone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.
- 4) Otherwise, click the "Create an Account" link. Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
- 5) Find your course in the list (you may need to expand the subject and term categories) and click the link.
- 6) If your course requires a key code, you will be prompted to enter it.
- 7) If your course requires payment, select a payment option and following the remaining instructions.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to [support@saplinglearning.com](mailto:support@saplinglearning.com) explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

## Specific, Measurable Student Behavioral Learning Objectives

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

- 1) Use the Henderson-Hasselbalch equation and knowledge of buffers to calculate how to make a specific buffer a given pH
- 2) Identify and name the 20 standard amino acids, their functional groups, and classify as hydrophobic or hydrophilic
- 3) Discuss protein structure (primary, secondary, tertiary and quaternary structures)
- 4) Calculate  $K_m$  and  $V_{max}$  from kinetic data from enzymes
- 5) Distinguish between the kinetic effects of competitive, uncompetitive, and mixed inhibitors
- 6) Name the structures of the common monosaccharides and disaccharides
- 7) Identify the structures of the five major nucleotides and describe how base composition affects DNA stability
- 8) Describe the process of DNA cloning and at least one system that can be used for expression of recombinant proteins
- 9) Identify differences in the chemical composition and structure of RNA polymers compared to DNA
- 10) Explain how polymerize chain reaction (PCR) works
- 11) Recognize the structures of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, and cholesterol
- 12) Explain the effects of fatty acid saturation on membrane fluidity
- 13) Explain why ATP is a high-energy compound
- 14) Calculate ATP costs and yields from all pathways studied: glycolysis, gluconeogenesis, citric acid cycle, glycogen metabolism
- 15) Compare different modes of regulation of metabolism, including feedback inhibition, covalent modification of enzymes, and gene expression.
- 16) Describe how glycolysis and gluconeogenesis are coordinately regulated
- 17) Relate the concepts of reduction potential and free energy
- 18) Describe the role of the proton gradient in the function of ATP synthase
- 19) Diagram how glycolysis, the citric acid cycle, the electron transport chain, and ATP synthase are linked.
- 20) Explain why humans breathe oxygen and exhale carbon dioxide

## 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.

### CHE 4310 Schedule (subject to change)

Spring 2018

Week	Dates	Lecture Topics	Chapters to Read	Homework*	Reviews**
1	01/16 01/18	Course Introduction Lecture 1: Intro to Biochemistry, Water and Buffers	1 & 2	HW 1	
2	01/23 01/25	Lecture 2: Nucleic Acids	4	HW 2	
3	01/20 02/01	Lecture 2: DNA Technologies	4		Review #1
4	02/06 02/08	<b>EXAM 1 (02/06): Chap 1, 2 &amp; 4</b> Lecture 3: Amino Acids	5	HW 3	
5	02/13 02/15	Lecture 3: Protein Primary Structure Lecture 4: Three Dimensional Structure of Proteins	6	HW 4	
6	02/20 02/22	Lecture 4: Three Dimensional Structure of Proteins Lecture 5: Protein Function: Binding	7	HW 5	
7	02/27 03/01	Lecture 6: The Energetics of Life & Enzymes	3 & 8	HW 6	Review #2
8	03/06 03/08	<b>EXAM 2 (03/06): Chap 5-7</b> Lecture 6: Enzymes	8		
9	03/13 03/15	Lecture 7: Lipids & Membranes	10	HW 7	
10	03/19- 03/23	<b>Spring Break!!! ☺</b>			
11	03/27 03/29	Lecture 8: Carbohydrates	9	HW 8	Review #3
12	04/03 04/05	<b>EXAM 3 (04/03): Chap 3,7-9</b> Lecture 9: Chemical Logic of Metabolism	11	HW 9a	
13	04/10 04/12	Lecture 9: Carbohydrate Metabolism	12	HW 9b	
14	04/17 04/19	Lecture 10: The Citric Acid Cycle	13	HW 10	Review #4
15	04/24 04/26	<b>EXAM 4 (04/24) Chap 11-13</b> Lecture 10: The Citric Acid Cycle	13		
16	05/01 05/03	Lecture 11: Electron Transport Chain, Oxidative Phosphorylation (& Semester Review – Time Permitting)	14	HW 11	Review #5
FINAL	TBA	Final Examination	n/a	--	

**NOTE: Exams will be during the assigned Tuesday course meeting and will last for the duration of the course meeting time. Whatever content we finish in lecture between exams and up to the Tuesday prior you will be accountable for (hence, you have one full week to study exam material).**

\*Homework is assigned at the commencement of each lecture. **All homework assignments are due on May 4<sup>th</sup> by 11:55p.**

\*\*Reviews will be available on Blackboard one week prior to the exam (posted after Tuesday's lecture). Review keys will be posted the Sunday before exams at 12p.