

General Biochemistry
BMB 401 (Section 002)
Fall 2018
Tuesday and Thursday 1:35 p.m. - 2:50 p.m.
110 Wartik Lab

Instructor: Dr. Craig E. Cameron
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Office hours: Sundays from 3:00 - 5:00 p.m. (must sign up on CANVAS by Sat. 5:00 p.m.)
Office hours will be held in 202 Althouse or 101 Althouse, depending on the number signed up.

Course Description and Learning Objectives

This course will introduce you to the fundamentals of biochemistry. A majority of the course will be devoted to introducing you to structure and properties of biomolecules and their corresponding assemblies. Techniques used to study biomolecules will be discussed. Concepts in biological regulation will be presented. The course will conclude with an introduction to the kinetics and mechanisms of biocatalysts.

At the end of this course, you should understand the following:

- relationship between structure, dynamics and function in biological molecules
- naming and classification methods for the four primary types of biological molecules (proteins, carbohydrates, lipids, and nucleic acids)
- biochemical methods that are used to analyze biological molecules
- mechanisms to increase reaction rates in biological processes
- regulation of biomolecule activity by interactions and modifications
- application of kinetic and thermodynamic principles to biochemical reactions
- how receptor proteins and enzymes are used in signaling pathways in order to control the response of a cell to its environment

Prerequisite courses: BMB 251 or BIOL 230; CHEM 210

Required Materials

Clickers: An i>clicker remote must be purchased for the lecture portion of the course. i>clicker is a response system that allows you to respond to questions during class. You will be graded on that feedback and/or your in-class participation. The i>clicker will be used every class period, and you are responsible for bringing your remote to lecture. In order to receive credit for clicker questions, you will need to register your i>clicker remote online (clickers.psu.edu) no later than the end of the regular add/drop period.

Textbook: Voet, Voet, and Pratt (2016) Fundamentals of Biochemistry 5th Ed. (Wiley)

Lecture Notes: Lecture notes will be posted to CANVAS by noon on the day of the lecture.

Assessments

In-class i>clicker questions: The clicker frequency in **110 Wartik is BB**. We will use i>clicker questions in class to make lectures participatory, to monitor attendance, and to allow you to gauge your understanding of the material relative to other students. This is for your benefit, to make the class more engaging and provide an opportunity for non-auditory learning. **Nuts and bolts of i>clicker questions:** Each lecture's i>clicker questions will be worth 2.5 points. With 26 lectures at 2.5 points per class, you have the opportunity to accrue 65 points on i>clicker assessments but only 50 points are needed. **Do not send your i>clicker to class with anyone else - this constitutes cheating.** Anyone observed using more than one clicker in class will forfeit all clicker points for that day, on every clicker they were using. Because you can miss up to 6 classes of i>clicker-questions without affecting your grade, there will be no make-ups due to late course additions, medical excuses, or other reasons.

Quizzes: Prior to beginning a series of lectures covering a specific chapter in the textbook, a quiz will be administered using the i>clicker system. These quizzes are based on the reading assigned for each lecture, and they are meant to draw your attention to key points from this material. Therefore, it is imperative that you read the assigned reading before class material. Indeed, it would be most helpful to complete the questions at the end of the chapter before class. Collaboration is not permitted when completing quizzes. **Nuts and bolts on quizzes:** Each quiz will be worth 10 points. With 11 chapters, excluding the first two chapters and 10 points per quiz, you have the opportunity to accrue 110 points on quizzes. Only 65 points are needed; therefore, there will be no make-up quizzes for any reason.

Homework: For each unit, defined by material covered on a single exam, a corresponding article from the primary literature and a corresponding list of questions and/or problems will be assigned as homework. The homework must be submitted at the beginning of the class period in which the paper will be discussed. **Nuts and bolts on homework assignments:** Each homework assignment will be worth 5 points. With four assignments, 20 points are possible. All 20 points are needed. Late assignments will not be accepted.

Group Discussions: Each assigned article and problem set will be discussed during the indicated class period in a small group setting. Groups will be assigned at random prior to the first group discussion. Your group assignment will be maintained throughout the semester. Each group discussion will be facilitated by a learning assistant or a member of my research team. You should be able to describe each figure in the article. In particular, you should know the question being asked in each figure, the approach used to address the question, the control experiments performed, and the conclusion of the experiment. Your participation will be graded by the facilitator. **Nuts and bolts on group discussion:** Participation in each group discussion will be worth 5 points. With four assignments, 20 points are possible. Only 15 points are needed. Therefore, there will be no "make-up" discussions for any reason.

Exams: There will be a total of four exams. All exams will be administered in class. Each exam will focus on a single unit, but exams will be cumulative in terms of the concepts involved because many aspects of the material covered in the class build on items from previous units. Exams can include a combination of multiple choice, fill in the blank, and open-response questions. **Each of the first three exams will count for 250 points; the fourth exam will count for 100 points.** The instructor reserves the right to change the format of any exams over the course of the term.

A make-up exam will be given only with the instructor's **PRIOR** approval. **Unless it is an emergency room situation**, any request for a make-up exam should be made by contacting the instructor via email **at least 24 hours before the exam time. The date of the make-up exam will be determined in consultation with the instructor. Please note that the make-up exam may be deferred to finals week and consist of a comprehensive exam covering material from the entire class.** The instructor reserves the right to change the format and/or timing of the make-up exam, and the exam could be a combination of short answer/essay/multiple-choice/oral format. Missing a scheduled make-up exam will result in a zero score for the missed exam.

Grading

Exams	<u>Points Available</u>	<u>Points Counted</u>
3 @ 250points each	850 points	850 points
1 @ 100 points		
Clicker points		
26 @ 2.5points/lecture	65 points	50 points
Quizzes		
11 @ 10points each	110 points	65 points
Homework		
4 @ 5 pointseach	20 points	20 points
Group discussion		
4 @ 5 points	20 points	15 points
Totals:	1065 points	1000 points

Grading scale: I anticipate using a normal scale but will consider a curve as data become available to justify such a decision.

- A 90-100
- B 80-89
- C 70-79
- D 60-69
- F 0-59

Academic Integrity

Academic dishonesty is not limited to simply cheating on an exam or assignment. The following is quoted directly from the "PSU Faculty Senate Policies for Students" regarding academic integrity and academic dishonesty: "Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used

without informing the instructor, or tampering with the academic work of other students." All University and Eberly College of Science policies regarding academic integrity/academic dishonesty apply to this course and the students enrolled in this course. Refer to the following URL for further details on the academic integrity policies of the Eberly College of Science: <http://www.science.psu.edu/academic/Integrity/index.html>. Each student in this course is expected to work entirely on her/his own while taking any exam, to complete assignments on her/his own effort without the assistance of others unless directed otherwise by the instructor, and to abide by University and Eberly College of Science policies about academic integrity and academic dishonesty. Academic dishonesty can result in assignment of "F" by the course instructors or "XF" by Judicial Affairs as the final grade for the student.

The Eberly College of Science Code of Mutual Respect and Cooperation

(<http://science.psu.edu/climate/support-and-resources/code-of-mutual-respect-and-cooperation/Code-of-Mutual-Respect%20final.pdf>) embodies the values that we hope our faculty, staff, and students possess and will endorse to make The Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

The Eberly College of Science is committed to the academic success of students enrolled in the College's courses and undergraduate programs. When in need of help, students can utilize various College and University wide resources for learning assistance. (<http://www.science.psu.edu/advising/success>)

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Student Disability Resources (SDR) at [814-863-1807](tel:814-863-1807) (V/TTY). For further information regarding SDR, please visit their website at <http://equity.psu.edu/student-disability-resources/>. In order to receive consideration for course accommodations, you must contact SDR and provide documentation (see the documentation guidelines at <http://equity.psu.edu/student-disability-resources/guidelines>). If the documentation supports the need for academic adjustments, SDR will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact SDR and request academic adjustment letters at the beginning of each semester."

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

Counseling and Psychological Services at University Park (CAPS)
(<http://studentaffairs.psu.edu/counseling/>) : 814-863-0395

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual

orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias webpage (<http://equity.psu.edu/reportbias/>).

Lecture	Date	Topic	Chapter
1	Aug 21	Course overview	
2	Aug 23	Amino acid structure, stereochemistry and derivatives	4
3	Aug 28	Protein structure: secondary structure	6
4	Aug 30	Protein structure: tertiary and quaternary structures; stability and folding	6
5	Sep 4	Protein purification	5
6	Sep 6	Paper 1	CANVAS
7	Sep 11	Protein function: myoglobin and hemoglobin	7
Exam 1	Sep 13	Exam 1 covers: chapters 1, 2, 4, 5 and 6; lectures 1 - 6	
8	Sep 18	Lecture by Boehr, Hafenstein and Yennawar Biomolecular structure, dynamics, and function	CANVAS
9	Sep 20	Carbohydrates	8
10	Sep 25	Nucleotides and nucleic acids	3
11	Sep 27	Nucleic acid structure	3
12	Oct 2	Lipids	9
13	Oct 4	Paper 2	CANVAS
14	Oct 9	Biological membranes	9
Exam 2	Oct 11	Exam 2 covers: chapters 3, 7, 8 and 9; lectures 7-13	
15	Oct 16	Membrane transport	10
16	Oct 18	Properties of enzymes, activation energy, reaction coordinate	11
17	Oct 23	Catalytic mechanisms of enzymes	11
18	Oct 25	Catalytic mechanisms: lysozyme and serine proteases	11
19	Oct 30	Enzyme reaction kinetics	12
20	Nov 1	Paper 3	CANVAS
21	Nov 6	Enzyme reaction inhibition	12
Exam 3	Nov 8	Exam 3 covers: chapters 9, 10, 11 and 12; lectures 14 - 20	
22	Nov 13	Drug discovery and development	CANVAS
23	Nov 15	Lecture by Dr. Jason D. Graci, PTC Therapeutics Drug discovery and development	CANVAS
-	Nov 20	FALL BREAK	----
-	Nov 22	FALL BREAK	----
24	Nov 27	Biochemical signaling	13
25	Nov 29	Paper 4	
26	Dec 4	Biochemical signaling	13
Exam 4	Dec 6	Exam 4 covers: chapter 12 and 13; lectures 21 - 26	

Important dates to remember:

Quizzes	
Chapter	Date
Ch. 4	Aug. 23
Ch. 6	Aug. 28
Ch. 7	Sep. 11
Ch. 8	Sep. 20
Ch. 3	Sep. 25
Ch. 9	Oct. 2
Ch. 10	Oct. 16
Ch. 11	Oct. 18
Ch. 12	Oct. 30
Ch. 13	Nov. 27

Homework	
	Due
HW 1	Sep. 6
HW 2	Oct. 4
HW 3	Nov. 1
HW 4	Nov. 29

Exam Dates	
Exam 1	Sep. 13
Exam 2	Oct. 11
Exam 3	Nov. 8
Exam 4	Dec. 6