

BIOCHEMISTRY 56100

Summer 2017

Mon Wed Fri / 3:30 - 5:20 pm / BCHM 105

INSTRUCTOR

Sandra Rossie, Professor of Biochemistry

Office: BCHM 315A

E-mail: rossie@purdue.edu

Office hours: by appt

TEACHING ASSISTANTS

Srishti Chakravorty, Biochemistry Graduate Assistant

Office: Hans 225

E-mail: chakrav9@purdue.edu

Office hours: Wed 2pm-3:30pm BCHM 110

Arrange meetings at alternate times, if needed, by email

Allison Norvil, Biochemistry Graduate Assistant

Office: BCHM 313

E-mail: anorvil@purdue.edu

Office hours: Mon 2pm-3:30pm BCHM 110

Arrange meetings at alternate times, if needed, by email

TEXTBOOK (Required)

Berg, J. M., Tymoczko, T, L, Gatto, G. J. Jr., and Stryer, L. (2015) Biochemistry, 8th Edition (W. H. Freeman & Co.) ISBN-10: 1-4641-2610-0; ISBN-13: 978-1-4641-2610-9
E-edition with electronic problems, support, etc also available

<http://www.macmillanlearning.com/Catalog/elearningbrowsebymediatype/LaunchPad>

<https://reg.macmillanhighered.com/Account/Unauthenticated?TargetURL=http%3a%2f%2fwww.macmillanhighered.com%2flaunchpad%2fberg8e%2f1597451>

PREREQUISITES

You are expected to have a basic understanding of organic chemistry and must have a minimum grade of C- in one of the following courses (or an equivalent course from other institutions): CHM 25600, CHM 25700, CHM 26200, CHM 26605, MCMP 20500, CHEM C3420. If you have any concerns about your preparation for BCHM 561, please see the instructor as soon as possible.

DEPARTMENTAL LEARNING OUTCOMES ADDRESSED BY BCHM 56100

BCHM 561 students will understand the molecular principles of life based on the core disciplines of biology, chemistry and physics. Students will:

- Be able to draw the chemical structures of the building blocks of biological macromolecules, including amino acids, nucleotides, sugars and fatty acids.
- Explain how higher order structures of proteins, nucleic acids and polysaccharides are formed from their respective building blocks.
- Demonstrate understanding of the thermodynamic principles underlying chemical reactions and formation of complex structures.
- Interpret and apply the principles of enzyme catalysis and regulation.
- Describe lipid membrane structure and function.
- Explain how genetic information is encoded and transferred in biological organisms.

COURSE OBJECTIVES

The major goal is to understand the basic biochemical properties of proteins and nucleic acids. First, we review basic concepts in general and organic chemistry that will be crucial for studying the structure and function of nucleic acids and proteins. A key theme for the course is to understand the relationship between structure and function in biomolecules. Structure-function relationships remain an important aspect of research in biochemistry.

The first macromolecules we will consider are the nucleic acids- RNA and DNA. We will learn the structure and properties of the nucleotides, which are monomers that are linked together to make the DNA and RNA polymers of the cell. DNA carries the precious genetic information that specifies, to a large degree, who we are and what we look like. Our DNA carries the information used to build proteins. We will briefly examine the basic mechanisms used to transfer the information carried in the sequence of our DNA to the molecular machinery that assembles the proteins of the cell (these processes are commonly referred to as the central dogma).

Proteins mediate virtually every process that takes place in the cell and we want to understand how these macromolecules do this remarkable job. We will spend considerable time learning about the biochemical properties of proteins so we can understand how they can perform so many vital functions in the cell. In this endeavor, it will be important to thoroughly understand the structure and chemical properties of the amino acids that are the monomeric units of the protein polymers. Despite being built from only 20 amino acids, proteins exhibit tremendous diversity. We will use hemoglobin as a model for thinking about the basic properties and function of proteins. Then, we will study

enzyme kinetics and the mechanisms by which enzymes catalyze biochemical reactions. Another important objective is to learn how enzymes are regulated. Examining the properties of carbohydrates and lipids is also a goal of this course. If time permits, we will learn how lipids form membranes.

BLACKBOARD

This syllabus, lecture notes, course announcements, answers to exams, and any assignments will be posted on the [Blackboard Learn website](#) for the course. Please note that lecture notes may NOT be posted before class. *We will try to make sure notes are posted as soon as possible, however, we **cannot guarantee a specific time for posting lecture notes.***

LECTURE RECORDINGS

Lecture audio and accompanying screen images will be recorded and made available on the course website on Blackboard Learn.

ELECTRONIC DEVICES

All electronic devices must be turned off and stored during class unless being used for homework problems. This includes the following: laptop computers, cell phones, iPads or similar tablets, iPods or similar MP3 players, Kindles or other readers, camcorders, and cameras.

CLASS ATTENDANCE

In accordance with University policy on class attendance, there is an expectation that you will attend every scheduled class. In this course, class attendance is not recorded and will not directly affect your grade. If you have a valid reason for missing class such as an illness, family emergency, bereavement, religious observances, or most University-sponsored activities, the instructor or TA will assist you in obtaining information and materials you may have missed. However, students who do not attend class without a valid excuse should not expect the instructor or TA to provide special help or supply class notes or materials. If you have a valid reason for your absence, any assignments, coursework, or quizzes missed because of failure to attend class may be made up at the discretion of the instructor (for relevant University policy, see: http://www.purdue.edu/studentregulations/regulations_procedures/classes.html)

USE OF COPYRIGHTED MATERIAL

Among the materials that may be protected by copyright law are the **lectures, notes, and other material presented in class or as part of the course.** Always assume the materials presented by the instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be “derivative works” of the instructor’s presentations and materials, and they are thus subject to the instructor’s copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern.

EXAMINATION AND GRADING POLICIES

Exams and Grades –Semester grades are calculated from scores on three exams (100 points each) that count equally toward the final grade, together with a series of home works (100 points total). Thus a maximum of 400 points can be earned. Grades will be assigned according to standard grading schemes as follows:

GRADE	% OF TOTAL POINTS
A	90-100
B	80-89
C	70-79
D	60-69
F	≤59

Exams 1 and 2 will be held during the first hour of class on the days they are scheduled. Exam 3 will be given at the time and place assigned for the final exam. The final exam will not be cumulative, but will emphasize material covered since Exam 2. However, answers for Exams 2 and 3 may require an understanding of subjects covered earlier.

Exams are designed to be finished within one hour, and we will not be able to allow extra time to complete Exams 1 and 2. This means you should work quickly and efficiently to finish the exams. Depending on scheduling for finals, we may be able to permit extra time on the third exam. *If you fail to promptly return your exam when requested by the exam proctor(s), your exam may not be accepted and you will receive a grade of zero.*

Failure to take an exam at the scheduled time will result in the assignment of zero points. As described below, under certain *specific* circumstances makeup exams can be arranged.

EXAMS MUST BE WRITTEN IN PEN IN ORDER TO BE ELIGIBLE FOR ANY REGRADE REQUEST!

Quizzes – No quizzes are scheduled, but they may be given at the instructor’s discretion. If the instructor decides to administer a quiz, the date will be announced in advance.

Optional Review Sessions – Before each exam, one of the TAs will lead an optional review session.

Extra Credit – ***There is no official mechanism for earning extra credit in this course.*** However, the instructor may elect to give an extra optional final exam covering material from EXAMS 1 and 2. Individuals may take this exam in addition to exam 3, and replace a

low score on EXAM 1 or 2 with a higher score on this extra optional final exam.

Makeup Exams (Srishti)– Make-up exams will be given for following reasons: a University- sponsored activity, religious observance, illness or medical emergency, certain family emergencies, and bereavement. If you have a conflict because of a *University-sponsored activity*, or *religious observance*, you must let the instructor know at least two weeks before the exam. If you cannot attend the exam because of an *illness* or *serious injury*, please let the instructor know as soon as it becomes clear that you will be unable to take the exam, preferably at least 24 h in advance of the exam time. Notification of an illness or medical emergency, should be sent to the instructor (cc TA) via email. We recognize that advance notice may not be possible for certain illnesses or injuries. In this case, you should contact the instructor or TA as soon as you are able to do so. Requests for makeup exams due to illness or emergencies presented after an exam will be accepted at the discretion of the instructor. Documentation of illness (note from physician, PUSH) will be required. In cases of bereavement, we adhere to the University's Grief Absence Policy for Students (GAPS). See: http://www.purdue.edu/studentregulations/regulations_procedures/classes.html). We expect students to be flexible and as accommodating as possible when scheduling makeup exams with the TA or instructor.

Final Exam Conflicts (Srishti)– We adhere to the following University Policies on Final Exam Conflicts: “Students scheduled for more than two examinations in one calendar day are entitled to reschedule any examinations in excess of two. Similarly, students faced with a direct exam conflict are entitled to reschedule either examination. It is the responsibility of the student to make the necessary arrangements before the last week of regularly scheduled classes.” The Final Exam will only be rescheduled in cases that meet the University Policies such as certain professional or University-related activities, illness or family emergencies. **Do NOT** make travel plans that require your departure before the final exam because you will not be allowed to reschedule the exam for this purpose.

Grade Appeals (Allison)– Every effort will be made to accurately grade exams, but grading mistakes are unavoidable. If you feel that grading errors have been made, you may submit a **written request** for a regrade to the TA. Regrade requests should be submitted by email from a Purdue account. The subject line should contain the text, “**BCHM 561 S17 regrade request**” followed by your name. The written request should give a clear and specific reason why you believe your answer(s) should be reconsidered. In this case, simply stating, “I feel I deserve more credit” or “What is wrong with my answer” is not sufficient justification. The exam must then be provided to the TA at the next class meeting. (If desired, the written request can accompany the exam). **No work that has been filled out with a pencil or an erasable pen will be regarded.** The TA may regrade the entire exam in the case of unreasonable or inappropriate regrade requests. The only exceptions to the written request are cases where the total points are miscalculated (arithmetic errors). **Requests for regrades must be submitted to the TA no later than 6:00 PM on the fourth day after the graded test has been made available to you.** Present all regrade requests to the TA first; if

you disagree with the T.A., she will bring your case to Dr. Rossie and if needed Dr. Rossie will decide and discuss it with you.

EMAIL POLICY

The instructor and TAs will accept email sent only from Purdue accounts. Please be sure to include the course number and your full name in the subject field (e.g. **BCHM 561 S17, Joe Smith**). The instructor will attempt to respond to all email sent to schedule meetings, or manage administrative issues or problems. However, when sent via email, the instructor will not guarantee an email response to questions on biochemical subject matter. Those questions requiring only a short reply may be answered, but it is likely that any question requiring a lengthy written response will go unanswered. Please consult the textbook or lecture notes for answers to these questions or consider asking a classmate for help. The instructor or TAs will be available during office hours to answer detailed questions or as needed (Dr. Rossie). If you cannot attend office hours please contact the TAs or instructor to arrange alternative meeting times.

SUGGESTIONS FOR STUDYING BIOCHEMISTRY

We cover a large amount of detailed material in this course. It is very important to read the chapters and study the notes and text on a regular basis. Do not allow yourself to fall behind and then find it necessary to cram just before exams. This is particularly important during this summer semester because we follow a fast pace. If you have questions or need assistance with your studies, please see the TAs at their office hours. Please do not wait until the last minute to seek help.

During the first lecture, Dr. Rossie will outline a strategy for studying BCHM 561. Many but certainly not all students find this helpful. An important step is to perform some type of self-assessment as you conduct your studies to find out what you do and do not understand. At times there will be structures that must be learned. This can be approached as a mindless memorization project or can be addressed in an alternative and more compelling manner in which you learn structures at least in part by using them in your studies.

The lecture notes and diagrams presented in class **may not necessarily** be made available to you in advance of class. There may be a few cases when supplemental written materials not found in the textbook are handed out or made available on [Blackboard](#) before the material is covered in class. Lecture notes and selected diagrams/images will be made available on [Blackboard Learn](#) after lectures have been presented.

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. You will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to

improving education at Purdue University. I strongly urge you to participate in the evaluation system.

DROPPING BCHM 561

- Jun 18 Last day to drop with no record (*Students may drop courses via myPurdue*)
- Jun 23 Last day to withdraw from a course with a grade of W (*Advisor's signature required*)
- July 12 Last day to withdraw from a course with a W or WF grade assigned (*Advisor's and Instructor's signature required*)

ACADEMIC INTEGRITY

Academic misconduct will not be tolerated in this course. It is particularly important to understand that the pursuit of scientific knowledge requires that all involved in this endeavor exhibit high integrity and adhere to the highest ethical and intellectual standards. It is crucial for those of you earning degrees in scientific fields to follow the high standards of ethical conduct expected of scientists.

Information on Purdue's policies with regard to academic misconduct can be found at: [http:// www.purdue.edu/studentregulations/student_conduct/regulations.html](http://www.purdue.edu/studentregulations/student_conduct/regulations.html)

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as earning a lower or *failing grade* on an exam or assignment or receiving a lower or *failing grade* for the course.

The following text on academic misconduct is taken from the University "*Regulations Governing Student Conduct, Disciplinary Proceedings, and Appeals*" found at the [website given above](#):

"Dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty. The commitment of the acts of cheating, lying, stealing, and deceit in any of their diverse forms (such as the use of ghost-written papers, the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) are dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest. (University Senate Document 72-18, December 15, 1972)."

You are asked to review the [Purdue University Code of Honor](#).

NON-DISCRIMINATION POLICY STATEMENT

[Purdue University's non-discrimination policy](#) will be upheld in this classroom. Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to

reach his/her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course consult the class Blackboard site. Under these circumstances, please check your Purdue email as well as the course Blackboard site frequently since we may need to communicate information and instructions about the course.

Lecture	Date	Day	Ch	TOPIC
1	06/12	Mon	1,8.2	Course Policy / Basic Concepts from Chemistry
2	06/14	Wed	1,8.2	Basic Chemical Thermodynamics
3	06/16	Fr	1	Properties of Water (take home self graded quiz)
4	06/19	Mon	1	Properties of Water / pH, Homework 1
5	06/21	Wed	4	Nucleotides / Nucleic Acids
6	06/23	Fr	4	Nucleic Acid Structure/Function Homework 1 due
7	06/26	Mon	2	Amino Acids
8	06/28	Wed	2	Amino Acids / Polypeptides / Protein Primary Structure H2
9	06/30	Fr	2	Protein Primary and Secondary Structure/REVIEW time?
10	07/03	Mon	2	Protein Tertiary Quaternary Structure, Function H2 due
	07/05	Wed		EXAM 1 (3:30 - 4:30 PM) Lect 1-9 through primary structure
11	07/05	Wed	7	Protein Function: Hemoglobin (4:30 - 5:20 PM)
12	07/07	Fr	7	Protein Function: Hemoglobin, Homework3
13	07/10	Mon	8	Enzyme Catalysis/Kinetics
14	07/12	Wed	8	Enzyme Catalysis/Kinetics Homework 3 due
15	07/14	Fr	8, 9	Enzyme Catalysis / Enzyme Kinetics/REVIEW time?
16	07/17	Mon	9	Enzyme Catalysis/Kinetics
	07/19	Wed		EXAM 2 (3:30 - 4:30 PM) Lect 9-15 through ch 8 material
17	07/19	Wed	10	Enzyme Regulation (4:30 - 5:20 PM) Homework 4
18	07/21	Fr	10, 11	Enzyme Regulation/ Carbohydrates
19	07/24	Mon	11	Carbohydrates Homework 4 due
20	07/26	Wed	11, 12	Carbohydrates / **Lipids and Membranes
21	07/28	Fr	12, 13	**Lipids and Membranes / ** Membrane Transport
22	07/31	Mon	13	** Membrane Transport
				FINAL EXAM (Exam 3) Lect 15 (kinetics)-22 (Time TBA)
				** Chapter 12 and 13 will be covered only if time permits