

BIOCHEM 301: INTRODUCTORY BIOCHEMISTRY I FALL 2013

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Course Meeting Times and Location:

Lectures: Mon and Wed, 10:05-11:20 AM
Midterm Exams and Optional Recitations: Fri, 10:05-11:20 AM
Griffith Film Theater

Welcome to BIOCHEM 301! The purpose of this class is to give you an introduction to the chemistry of living organisms, focusing on two main topics: (1) foundation material required for all study of biochemistry, including an understanding of the basic chemical principles affecting life as well as a knowledge of the structure and function of the biological macromolecules; and (2) the metabolic processes of energy utilization, from the level of atoms and electrons up through animal physiology. We will pay particular attention to the thermodynamics and kinetics that govern chemistry in living organisms, the evolutionary history of metabolic processes, and how metabolism works in humans. We will also take time to note some of the more exciting recent advances in the field.

While the exams and other assignments will require you to have learned certain facts very well, the broader goal is for you to understand the concepts behind biochemistry well enough to apply them in explaining and analyzing various aspects of biological systems. You will also have an opportunity to develop your scientific writing skills by writing a paper explaining recently published biochemical research.

Prerequisites: The only formal prerequisite is two semesters of organic chemistry; while we are not concerned with techniques for organic synthesis, it is important that you be familiar with organic reaction mechanisms and the chemistry of common functional groups. I also assume familiarity with general chemistry, especially basic thermodynamics and kinetics, but I will make a point of reviewing most of this

material. I also assume some familiarity with basic cellular and molecular biology; if you have not had a course in that area, you will probably be OK, but you should prepare to do some outside reading to fill in gaps in your knowledge. I would be happy to recommend books.

Registration: Please be certain you have correctly registered for the course before the drop/add deadline. Those needing formal permission to enroll should contact me immediately. Auditors are welcome, and should speak with me about how to be added to the class rolls.

Course Website: A course website will be used for the posting of announcements, lecture notes/slides, practice problems and tests, course documents, and supplementary reading. The site is accessible at the following URL with login via Duke NetID:

https://sites.duke.edu/biochem301_01_f2013/

Please contact me immediately with any problems accessing the website. Visitors who do not have Duke NetID accounts will need to contact me to arrange for an account to be created.

Textbooks:

Nelson, D.L. and Cox, M.M. *Lehninger Principles of Biochemistry*. New York: W.H. Freeman and Co., 2005. 4th, 5th, or 6th ed.

Brandon, C. and Tooze, J. *Introduction to Protein Structure*. New York: Garland, 1999. 2nd ed.

The 6th edition of *Lehninger* was only recently released, and as a result the textbook store is stocking new copies of the 6th edition and used copies of the 5th. Regardless, you may choose the 4th, 5th, or 6th edition as you prefer; when they differ, I will list the equivalent assignments for both books.

Reading assignments in the textbooks will be given online as the course progresses. Additional readings may be posted, from time to time, on the course website or via E-reserves.

Lectures: Lectures will be held Monday and Wednesday of each week. The attached calendar shows the intended topics for each day. These are subject to change, however, depending on how the course progresses.

Most lectures will use an overhead projector and hand-drawn images rather than PowerPoint. When PowerPoint will be used, a copy of the PowerPoint slides for each day's lecture will be made available through the course website in advance of the lecture. Whenever possible, these will be posted by 5 PM the day before the lecture—however, last minute efforts to improve lectures may sometimes mean that the notes will not appear until as late as midnight. Your understanding on that point is greatly appreciated.

Friday Class Periods: We will use two of the Friday class periods for mid-term exams. The remainder will be used for optional recitations conducted by the TAs, during which they will re-present important material from recent lectures and take questions.

Attendance: Attendance for lectures is not required, but strongly recommended. Because most lectures are done without PowerPoint, it is important that you attend class to take notes. If you miss class, be sure to check with your colleagues for information that may have been given in formats other than PowerPoint slides. Attendance at recitations is optional.

Participation: No grade is given for participation, but it is strongly encouraged. Please don't hesitate to raise your hand and speak up!

Exams: Two 75 minute midterm exams and one three hour final exam will be administered, as indicated on the course schedule. These exams will require short written answers, drawings of structures and/or reactions, and short essays. No multiple-choice questions will be included. The midterm exams will be based on material covered in class on the dates indicated. The final exam will be given during the official final exam period on Saturday, December 14, 2-5 PM. It will be weighted towards the last third of the course, but you will be responsible for earlier material as well.

In completing the exams, you are encouraged to write only as much as is necessary to answer the questions. No points will be given for reciting extraneous facts, nor will points be given if you are asked to explain or analyze and you merely recite facts, nor will points be given for answering the question you thought would be asked rather than the question that was actually asked. Read questions carefully, think carefully about what is being asked, and when required, develop and present a coherent argument.

Practice Problems: Practice problems will be made available from time to time to give you the chance to test your understanding. These are purely optional. Answer keys will be provided. In addition, sample exams and answer keys from previous semesters will be posted before each exam.

Writing Assignment: To build connections with current research in the field of biochemistry, and to give you the chance to practice reading, thinking, and writing about scientific topics, you will be given a writing assignment based on published journal articles. At the end of the second week of the course, I will provide a list of journal articles associated with topics we are studying. You are to choose one article and write a paper of 1500 to 3500 words reviewing the work described in the paper, and placing that work in context relative to other work in the field. The paper is due at the start of class on October 28, 2013. Further details about this assignment will be provided later.

Grading: Each journal review will be read twice, either by two TAs or once by a TA and once by me, and a final grade given in consultation (normally by averaging the two, although in cases of wide disparity we may discuss our reasoning and try to reach agreement). Exams will be graded by the TAs. The writing assignment and exams will contribute to the final grade as follows:

Midterm Exam 1	25%
Midterm Exam 2	25%
Final Exam	35%
Writing Assignment	15%

The assignment of final letter grades will be based on the distribution of numeric grades, curved according to the following general criteria: "A" grades will be awarded for excellent performance and near complete mastery of the material, "B" grades for a solid understanding and generally good achievement on the tests, "C" grades for weak but acceptable performance, "D" grades for poor performance and a degree of understanding that is so weak as to be considered generally unacceptable, and "F" grades for a total or almost total lack of understanding or a failure to attempt the exams. In past years, typically 30-40% have received A grades of one kind or another, and 10-20% have received C grades or below. Final cutoffs and the extent of curving in any particular year will depend on student performance against the standard defined above.

Regrades: All regrade requests will be handled according to the following policy:

Calculation errors should be given to a TA, who will correct the grade and pass the correction along to me.

All other grading questions must be discussed first with the TA who graded the question. He or she can tell you exactly why you lost the points you did, and if he or she looks at your test and finds a mistake in the grading, he or she will write a signed note to me on the test explaining what correction needs to happen. You can then either leave the test with the TA who will give it to me, or you can turn it in to me after lecture, or you can turn it in to the box outside my office.

If you believe your answer should have been accepted or should have received more points than it did, but the TA disagrees, you may contest it as follows. First, ask the TA to write a note to me about the decision to reject your regrade request. Then, prepare a written statement to me giving your argument, and submit your statement as well as the test to me after lecture or in the box outside my office. I will not consider regrade requests unless there is a signed note from the TA one way or the other. I also will not consider regrade requests unless they are made in writing. All regrades must reach my office within two calendar weeks of the test date.

I am always happy to meet with you in office hours to discuss your tests, the course material, or your general performance. However, office hours appointments are not the time or place to make regrade requests. Instead, those should go through the process outlined above.

Make-Up Exams and Late Assignments: Make-up exams will only be given for extreme circumstances or emergencies, at my discretion. If a make-up exam is offered, it may be different from the exam given to the rest of the class. Students who miss an exam due to illness and who file a short-term illness form will generally not be offered the opportunity to make up the exam; instead, their average will be calculated by omitting that exam. Students who miss an exam without a valid excuse will receive a zero. If you know you will need to miss an exam for any reason, I strongly recommend that you contact me in advance to discuss the absence and to determine how it will be handled.

Unless an extension is granted due to extreme circumstances, late papers will lose one letter grade for each day (or portion thereof) that they are late.

Academic Integrity: Students are expected to comply with the Duke Community Standard at all times, as well as with the directions given regarding which assignments may be discussed with whom, and which work must be one's own. If you have a question about what is allowed and what is not, please ask, as we would not want any misunderstanding to become a problem. Cheating or unauthorized collaboration will NOT be tolerated.

Office Hours: The TAs will be available for scheduled office hours, as will be announced on the course web site. These will generally be conducted either at the TA's desk (for one or two people) or in nearby conference rooms (if there are many people); please go to the TA's lab and there will be instructions on where to go from there. In prior years we have also sometimes scheduled office hours in conference rooms in Perkins Library; we will note on the schedule if office hours will be in a location other than the TA's lab. If you cannot attend scheduled office hours please contact the TAs or me to arrange alternative times for help.

For those who need more help than the TAs can reasonably supply at scheduled office hours, the department maintains a list of senior graduate students who can be hired privately as tutors. Please contact Amy Norfleet (norfleet@duke.edu) in the Department of Biochemistry Graduate Studies Office for more information.

Finally, I am always happy to meet with you myself to answer questions about the material as well as to address other issues that may come up. Please contact me by email to arrange an appointment. My schedule tends to fill up early for exam weeks, but otherwise it is usually possible to find a time. I do appreciate your understanding if my schedule fills up.

BIOCHEM 301 FALL 2013
DETAILED COURSE SCHEDULE

Date		Topics
M	Aug 26	Introduction
W	28	Thermodynamics
F	30	<i>Optional recitation</i>
M	Sep 2	More Chemical Background: Acids & Bases, Intermolecular Interactions
W	4	Amino Acids; Protein Structure: 1°
F	6	<i>Optional recitation</i>
M	9	Protein Structure: 2°/3°/4°
W	11	Protein Structure: Why?; Methods for Studying Proteins
F	13	<i>Optional recitation</i>
M	16	Enzymes: General Principles, Catalysis
W	18	Enzymes: Kinetics
F	20	<i>Optional recitation</i>
M	23	Enzymes: Examples
W	25	Enzymes: Examples; Cooperativity and Allostery
F	27	<i>Optional recitation</i>
M	30	Intro to Metabolism and Review of Redox
W	Oct 2	Intro to Metabolism and Review of Redox <i>cont.</i>
F	4	Midterm Exam 1
M	7	Glycolysis and Fermentation
W	9	Gluconeogenesis; The Pentose Phosphate Pathway
F	11	<i>Optional recitation</i>
M	14	<i>(Fall Break—no lecture)</i>
W	16	The Krebs Cycle
F	18	<i>Optional recitation</i>
M	21	Oxidative Phosphorylation
W	23	Oxidative Phosphorylation <i>cont.</i> ;
F	25	<i>Optional recitation</i>
M	28	Regulation of Metabolic Pathways; Oxidative Stress and Reactive Oxygen Species
W	30	Biochemistry of Beer
F	1	<i>Optional recitation</i>
M	Nov 4	Fatty Acid Metabolism: Oxidation
W	6	Fatty Acid Metabolism: Synthesis
F	8	Midterm Exam 2
M	11	Amino Acid Metabolism
W	13	Amino Acid Metabolism <i>cont.</i> ; Nitrogen Physiology
F	15	<i>Optional recitation</i>

M	18	Human Physiology: Pathway Flux and Anaplerosis, Ketone Bodies, Glycogen
W	20	Human Physiology: Insulin/Glucagon, Eating, Starvation
F	22	<i>Optional recitation</i>
M	25	Guest Lecture: Chris Newgard—Insights into Diabetes and Obesity from Metabolomics
W	27	<i>(Thanksgiving recess—no lecture)</i>
F	28	<i>(Thanksgiving recess—no recitation)</i>
M	Dec 2	Human Physiology: Exercise, Diabetes
W	4	Energy Metabolism and the Evolution of Life
F	6	<i>Optional recitation</i>
Sa	14	Final Exam , 2-5 PM