Biochemistry and Cellular Metabolism

BIO 0152A – Summer Session I, 2008 – Tufts University
Meeting in Barnum 104. Tues/Thurs 6:00 – 9:30 PM.
Office Hours From 5:00-6:00 before class in classroom.
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THIS SYLLABUS IS A PRELIMINARY VERSION. CLASS SCHEDULE WILL BE AS LISTED, HOWEVER. NOTE NEW EDITION OF THE TEXT THIS YEAR!

OBJECTIVES:
1. To become familiar with the structure and function of the components of living matter at a molecular level; to study the relationship of biological function to chemical structure.
2. To study metabolism, the chemical reactions that occur in living organisms.
3. To study the connections between biochemical reactions and function of organs of the body.

Note: this is a *general biochemistry* course. It is not a reaction mechanisms, biophysics, or otherwise more specialized biochemistry course. Look over the syllabus and make sure you know what to expect. Do not be disappointed if it follows the text quite closely. Maximum learning will be achieved through your own study efforts, not by class lecture.

PREREQUISITES: Prerequisites: Introductory Biology (BIO 13) and Organic Chemistry I (CHEM 50 or 51), or the equivalent.

TEXTS:
Required:
1. *Lehninger Principles of Biochemistry* by David Nelson and Michael Cox, 5th Edition © 2008. ISBN 978-0-7167-7108-1. You will probably find it very useful to have text with you during class.
Recommended:
2. The Absolute Ultimate Guide to Lehninger Principles of Biochemistry Osgood and Ocorr 5th Ed 2009 ISBN 1-4292-1241-1.
3. Campbell-Reece's *Biology 6th or 7th Edition* is recommended as a supplementary text (or another basic biology text.) *(1 and 2 are available in Tufts Bookstore)*

HOMEWORK AND QUIZZES: Problems listed below are assigned for your benefit and *they will not be graded*. They are designed to help you keep up with class readings and prepare for the exams. Make sure you fully comprehend the solutions to the assigned problems. These are the minimum recommended problems, and you are encouraged to go beyond these, although this may not be realistic due to the pace of the course.

The main purpose of the daily quizzes is to make sure you don't fall behind in the readings, and for me to see who is keeping up with the workload. The reading listed for a particular class must be done before class, and the homework is to work on the end of chapter questions listed. If you miss a quiz due to lateness or absence it will be recorded as a zero. It is absolutely essential that you do not fall behind in the readings. There will be many temptations to do other things during the summer besides study, but you must realize that to do really well in this class you need to eat, sleep and breathe biochemistry for one month. This *is* your full time job, in other words.

PHILOSOPHY OF LEARNING: Experts agree that lecture format is not an ideal way to learn

and retain information. So as such how will your learning occur? Your best learning will occur when you struggle and interact with the material yourself, and spend the necessary time with the book and doing your own further study using web resources. For example, working through and puzzling over problems is one way that a great deal of learning will occur. Resist the temptation to peek at the answer in the back prematurely. Work the solution out for yourself by trying to synthesize and apply the information from that chapter. Only as a last resort when you have done your best to struggle over the problem should you look. The purpose of the lecture therefore serves as a reinforcement of ideas that are pretty well worked out in advance from your personal time investment. It does take a lot of time to become familiar with the amount of material covered in the course. Class time should help you see what is the most critical information, and make connections, and clear up points of confusion. *It is my sincere hope that you will not see this course as a drudgery of facts to be memorized, but rather, that you will gain a greater enthusiasm for the way cells work, and a desire to learn more.*

DISABILITIES: Students with disabilities who may need academic accommodations are asked to speak with the professor within the first week of class. Students are also responsible for making sure documentation of the disability is on file with the University.

ATTENDANCE and EVALUATION: Needless to say, with just 11 meetings, it is vitally important that you attend all classes.

	Exam 1	22%
	Exam 2	22%
	Exam 3	22%
note: your grade will be	Final Exam	22%
updated on-line at	Quizzes	12%
http://blackboard.tufts.edu	----------	
	Total=	100%

All grades will be based on an approximate scale as follows. (Minimum %, letter grade):

93% A	90% A-	86.7% B+	83.3% B	80% B-	76.7% C+
73.3% C	70% C-	66.7% D+	63.3% D	60% D-	< 60% F

COURSE SCHEDULE: (HOMEWORK QUESTIONS ARE NOT FINALIZED ON THIS VERSION!! – updated version will be provided through blackboard)

Date	Chapter	Topic	Homework
May 22	1	Foundations of Biochemistry	Ch 1: 3,5,6,7,9,13
Thurs	2	Water	Ch 2: 4,9,10,11,12,13,14,23
May 27	3	Amino Acids, Peptides, Proteins	Ch 3: 2,3,5,8,9,13,15,22
Tues	4	Protein Structure and Folding	Ch 4: 2,3,6,9,13
		Chromatography demonstration? – handout on chromatography	
		guest lecture Dr. Robert Jacob – CS available by Bb	
May 29	5	Protein Function	Ch 5: 1,2,5,7,9,10,12
Thurs	6	Enzymes, Enzyme kinetic	Ch 6: 1,2,3,4,8,11,13,19,21,22
		guest lecture Dr. Robert Jacob – CS available by Bb	

Jun 3		**Exam 1: Chapters 1-6** **********	
Tues	7	Carbohydrates and Glycobiology (after exam!)	Ch 7: 1,10,14,19,25,29
Jun 5	8	Nucleotides and Nucleic Acids (skip Ch 9)	Ch 8: 1,3,6,10,12,(16)
Thurs	10	Lipids	Ch 10: 1,2,3,18,19,22
	11	Membranes and Transport	Ch 11: 3,9,11,14,15,18,19
Jun 10	12	Biosignaling (lecture BEFORE exam)	Ch 12: 3,6,9,10,19,24,25
Tues		**Exam 2: Chapters 7,8,10,11,12** **********	
Jun 12	13	Bioenergetics- Thermodynamics, Phos. Tranfers	Ch 13: 1,2,4,8,13,15,19,20
Thurs		Also read p481-488. Good stuff!	
	14	Glycolysis	Ch 14: 2,10,11,23,14,16,25,27
Jun 17	15	Glycogen and Glucose use in Animals	Ch 15: 3,4,5,6,7,8,11
Tues	16	Citric Acid Cycle	Ch 16: 3,4,15,19,22,28,29,30
Jun 19		**Exam 3: Chapters 13-16** **********	
Thurs	17	Fatty Acid Catabolism (selected essentials)	Ch 17: 2,13,16,17,23,26
	18	Amino Acid Oxidation Urea Cycle (part 1-2 only)	Ch 18: 1,2,3,4,6,8,9,12
Jun 24	19	Ox Phos: Electron Transfer and ATP Synthesis (impt)	Ch 19: 2,7,8,10,13,18,28
Tues	21	Lipid Biosynthesis (selected essentials)	Ch 21: 1,2,3,4,7,12,15,16
	22	Biosynthesis of AA, NT and related molecules	Ch 22: 1,2,4,7,10,11,13,16
Jun 26	23	Hormonal Control of Metabolism	Ch 23: 2,6,7,8,9,12,13,16
Thurs	27a	**Final Exam on Chapter 17,18,19,21,22,23. Parts covered in class.** **********	

Note: the **final exam** will include only a few comprehensive questions: One on Enzyme kinetics, one question on amino acid biochemistry, and one question on comparing the Oxygen binding of Mb vs Hb. There will be some comprehensive *bonus* questions that you should do well on if you have done all the homework problems throughout the course.

In general, exams are mostly multiple choice and some short answer type questions. These questions are not easily guessable- you have to know your stuff. I will keep the number of questions down, so you can focus on really thinking through each question without rushing. Review sheets are posted on Bb to help guide your study efforts.

Look on Blackboard for lecture outlines as well as other information. In some cases, the exam contains information that is covered the same day in lecture. This underscores the importance of your outside efforts preparing for class. There will not be a quiz on a day that there is an exam.