

CHEM 4512/6502: Biochemistry II – Fall 2012

Tuesdays and Thursdays 9:35 am – 10:55 am
MoSE 1222

Course website available on T-Square: <http://t-square.gatech.edu/portal>

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Biochemistry II:

This course offers an introduction to metabolism, bioenergetics, the chemistry and biochemistry of coenzymes, and metabolic regulation. We will explore the anabolic (biosynthesis) and catabolic (degradation) processes for the major types of biological molecules. The molecules to be included for consideration include: carbohydrates, lipids, amino acids, nucleotides, and the larger biopolymers that use these monomers as building blocks. When appropriate, we will incorporate discussion on enzyme inhibition and some principles of medicinal chemistry (drug design). The goals of this course are to gain an understanding of: enzyme catalysis and mechanisms, how multiple enzymes can be coupled together to formulate a metabolic pathway, and how aspects of metabolism can affect the overall fitness of an organism. The faithful completion of reading assignments and problem sets and participation in class discussions will enhance your ability to remain abreast of the material being covered and to apply the concepts learned toward various types of biochemical and biotechnological situations.

You should complete the suggested reading for a topic **before** it is discussed in class and be prepared to ask and answer questions on the material during class. If, at any time, you feel that you are falling behind or need additional assistance, please speak with the Professor or Teaching Assistant and come to our office hours.

Prerequisites:

Two semesters of undergraduate organic chemistry and Biochemistry I (4512/6502). You should know the functional groups commonly found in biochemical compounds and their chemical properties. You should also know the fundamental reaction mechanisms common in organic chemistry. You should be able to draw a reaction mechanism using double-headed curved arrows to demonstrate the flow of electrons. You should be able to draw the structure of each natural amino acid, nucleotide, common lipids, and common carbohydrates (such as glucose). It is assumed that you are already familiar with these bio-molecules. It is highly recommended that you read through Chapters 11 and 12 to refresh your knowledge of the fundamentals of enzyme catalysis and kinetics.

Week of:	Topic:	Chapter:
Aug 21	Introduction to metabolism and bioenergetics	14
Aug 28	Quiz (Aug 28) August 28: Homework #1 Due Biochemical Signaling	13
Sept 4	Sept 4: Homework #2 Due Glucose metabolism	15, 16
Sept 11	Sept 11: Homework #3 Due	

	Glucose metabolism	15, 16
Sept 18	Sept 18: Homework #4 Due Integration and Regulation	22
	Sept 20: Exam I	
Sept 25	Integration and Regulation	22
	Citric acid cycle	17
Oct 2	Oct 2: Homework #5 Due Citric Acid Cycle	17
	Electron transport and oxidative phosphorylation	18
Oct 9	Oct 9: Homework #6 Due Electron transport and oxidative phosphorylation	18
	Photosynthesis	19
Oct 16	Oct 16: Fall Break Oct 18: Exam II	
Oct 23	Lipid metabolism	20
Oct 30	Oct 30: Homework #7 Due Lipid metabolism	20
	Amino acid metabolism	21
Nov 6	November 6: Homework #8 Due Amino acid metabolism	21
Nov 13	November 13: Homework #9 Due Nucleotide metabolism	23
	November 15: Exam III	
Nov 20	Nucleotide metabolism	23
	November 22: Thanksgiving	
Nov 27	Nov 27: Homework #10 Due DNA replication and repair, transcription, and translation	25, 26, 27
Dec 4	Dec 4: Homework #11 Due Special Topics (TBA)	TBA

Final Exam: Thursday, December 13; 8 am – 10:50 am

Grading:

Midterm Exams (300 pts; 100 pts each)

Final Exam (200 pts): The final will be comprehensive, covering the entire semester.

Quiz (50 pts)

Homework (110 pts; 10 pts each): Each homework assignment is worth 10 points.

Three of the questions from each assignment will be chosen at random to be graded in detail. One point will be taken off automatically for each unanswered problem in addition to any other points subtracted from the graded questions. Homework is due at the start (i.e. 9:35 am) of the class period indicated. *To be considered for full credit, assignments must be turned in at that time. In addition, to be considered for full credit, you must ensure that your homework is stapled at the time you turn it in.*

Extra Credit (up to 5 pts): Due by 5 pm on Friday, December 7, but may be turned in any time during the semester prior to that. Find in the popular culture – from music, TV series, movies – a portrayal of a metabolic disorder that directly relates to the topics discussed this semester. Write up a paragraph that: (1) includes the title of the song, TV show (and episode), or movie; (2) includes the name of the metabolic disorder; (3) discuss whether or not that disease state was accurately portrayed.

There will most likely be a curve for the final grade based upon the overall class average, but the following are **guaranteed minimum cutoffs**:

Greater than 90% = A
Greater than 80% = B
Greater than 70% = C
Greater than 60% = D

TA Office Hours:

Rayaj Ahamed: Mondays, 3-4 pm. Buzz IBB wing 3-A and he will direct you to a common work area in IBB outside of the lab wings.

Optional Discussion Session: Fridays, 11 am, location: MoSE G021

Required Text: "Fundamentals of Biochemistry", 4rd Edition, Donald Voet, Judith G. Voet, and Charlotte Pratt. If you already have a copy of the 3rd Edition, you will probably be in okay shape. If there is something unique to the 4th Edition we will let you know. There should be a copy of the 4th Edition on reserve in the library for your reference.

Additional readings may be assigned and those will be posted on T-square.

Recommended Texts:

It is recommended that you have access to an Organic Chemistry and a General Chemistry textbook.

Also on reserve in the library is T. Bugg's "Introduction to Enzyme and Coenzyme Chemistry" and R. Silverman's "The Organic Chemistry of Enzyme-Catalyzed Reactions". These are very nice texts that describe the chemistry of enzymes, grouped according to the cofactor/coenzyme and/or type of chemistry, and are useful resources if you want to read up more on a certain class of enzyme or learn more about cofactor chemistry.

Missed Exams: There is no scheduled makeup exam. Planned absences for exam dates that coincide with an Institute Approved activity **must** be cleared with Prof. Kelly **no later than three weeks prior** to the date of the exam. In addition to the verbal request, the approval must be requested in an email message. **No exceptions.** (see <http://www.deanofstudents.gatech.edu> for information on Institute Approved Activities.)

Calculators for Exams: You are responsible for ensuring that you have an appropriate calculator for the exams. **Only** simple calculators are permitted – i.e. **no** programmable or graphing functions are permitted.

Re-grade requests: Requests must be made in writing and handed to Prof. Kelly in person. **Requests made to a TA will not be considered.** The re-grade request must be turned in no later than the Friday of the week in which the exam is returned (by 5 pm). No exceptions. **In all cases, the entire exam is subject to reassessment, not just the item in question.**

E-mail rules: E-mail can only be accepted from Georgia Tech accounts. When sending an e-mail, put the following information in the subject line: Chem 4512, firstname lastname, subject.

Example: Chem 4512, Gertrude Elion, Purine Metabolism

The e-mail must be composed in a professional manner. Use proper salutations, complete sentences and avoid text-message style abbreviations.

Laptops and Cell Phones: *As a courtesy for those sitting around you, these items are not permitted for use during class. Turn these items off prior to the start of each session.*

Please refer to the Georgia Institute of Technology's academic honor code: www.honor.gatech.edu, which you are required to uphold. *Academic dishonesty will **NOT** be tolerated.*