Biological Chemistry 262: Introduction to Biological Chemistry

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Contact policy: I generally check my e-mail between 8 AM and 6 PM on weekdays and once or twice a day on weekends, and will get back to you within 24 hours. Please feel free to stop by my office. If my door is open, I will make time to talk if I am able. If my door is closed, it means I'm in the middle of something and would appreciate not being interrupted.

Course Mentor: Yangyi Liu (liuyangy@grinnell.edu)

Office Hours:
Tuesday: 1-2 PM, Wednesday 11-12 AM, Thursday 10-11 AM.

I will be in my office and available to meet with individuals or groups during these scheduled office hours for questions or discussion about either the lecture or the lab. If you cannot make these times, feel free to call or e-mail me to schedule another time that works better for you. With less than 24 hours of notice, I may not be able to accommodate you but I will try to work something out.

Class Schedule:
Lecture: 9-9:50 AM Monday/Wednesday/Friday, Noyce 1302

Texts:
The main text for the course will be **Fundamentals of Biochemistry: Life at the Molecular Level (4th Ed.)**, by Voet, Voet & Pratt from John Wiley.

Additional reading materials will be made available in class or through Pioneer Web.

You are encouraged to reference your general chemistry textbook and organic chemistry textbook from time to time as we review material from previous courses.

There are a number of excellent texts on reserve in the Science Library that can help provide additional background or details throughout the semester. I highly recommend **Introduction to Protein Structure** by Branden & Tooze as a way to understand some of the structural motifs that are commonly found in protein folding.

Pre-requisites:
A solid background in organic chemistry (CHM 221) as well as biology (BIO 150, 251) is required for this course. You are required to be concurrently enrolled in (or have completed) Organic Chemistry II (CHM 222) as well.

Special Needs:
The success of every student in this class is important to me, and I assume that all of us come from different backgrounds and have different needs and learning styles. I am always open to suggestions of how you feel I can make the class more accessible to you, and am happy to work with you to develop strategies that will help you succeed in this course.

I encourage you to visit the Coordinator for Disability Resources, Autumn Wilke, located on the 3rd floor of the Rosenfield center (x3702) to help you find out how your learning could be improved. If you need official accommodations, you have a right to have them met, and the Coordinator for Disability Resources can provide you with documentation that will help me determine how to best provide them for you.

Academic Honesty:

Unless specifically stated in an assignment, all work turned in for credit must be done individually. All work turned in must be your own, and all citations and attributions of ideas and wording must be clear and correct. If you are unsure at any time, please see me. An excellent guide to avoiding accidental plagiarism can be found through Harvard's Writing School: http://usingsources.fas.harvard.edu/icb/icb.do?keyword=k70847&pageid=icb.page342054

Absence and Makeup Policy:

If you know of any days you will be unable to attend class, I encourage you to let me know as soon as possible so we can come to a mutual understanding of how best to allow you to meet the requirements of the course while attending to other important issues in your life. If an emergency situation prevents you from making a class session, or causes you to miss an exam/assignment without prior notice, makeup work can be arranged on an individual basis depending on the assignment.

Course Outline & Goals:

Introduction to Biological Chemistry will cover two main areas over the course of the semester: (1) the structure and properties of the main classes of biomolecules, and (2) metabolic processes related to synthesis and degradation of those biomolecules, including regulation and energy storage.

The structure and function portion of the course will cover amino acids (proteins), carbohydrates, nucleic acids and lipids. Each of these classes of molecules is largely composed of individual monomers that are polymerized to form the biomolecules (our genetic information, proteins, muscle tissue) that are biologically important. You will be expected to know structures of monomers, and the chemistry that connects them into the relevant biopolymers.

The metabolism portion of the course will cover how each of the classes of biomolecules are created and degraded, and how biological systems manage to balance energy and raw materials through regulation of these metabolic processes. An emphasis will be placed on understanding the theory behind regulation and connections between different pathways.

The schedule of topics at the end of the syllabus gives a rough overview of the order of topics and when we will cover them, but changes throughout the semester are likely to tailor the material to you, specifically.

Course Expectations & Grading:

I expect that proper preparation and studying for this course will take you about 2 hours out of class for every hour of credit. While recall of information is important, learning how interpret new concepts and information based on an understanding of the underlying principles is the driving motivation for this class. I expect to you to come to class having completed the suggested readings for the day.

In Class Discussion & Participation, Homework (9%):

I expect you to come to attend all classes, be prepared, and be actively involved in classroom activities and discussions. Homework will be given out in groups of weekly problems, some of which will be on material that has already been covered, and some of which will be on material that has not yet been discussed in class, but which you may know from your readings and previous classes. Homework will be graded based on completeness and a legitimate effort, with a focus on feedback and learning rather than correctness.

Problem Sets (6%):

As preparation for each exam, there will be a problem set encompassing the types of questions you can expect on the exam material. Each problem set will be worth 2% of your final grade. They will be due the week before the exam, to give time for any questions to be answered in office hours or class before the test.

Quizzes (4 total, 10%):

While structural knowledge of the different classes of biomolecules is important, it can distract from a focus on understanding principles. Accordingly, structural recall will be split out into 4 quizzes, one covering each class of biomolecules. You will be expected to draw proper chemical structures of monomer units and biopolymers for each quiz.

A final paper/project based on metabolism will be available in the last week of the semester that can replace a low or missed quiz score. Details of this project will be available after Spring Break.

Exams (3 midterms, 1 comprehensive final, 50% total):

There will be three exams spaced throughout the semester (10% each), with a comprehensive final exam worth 20%. The final exam will also include material on the integration of metabolism from the last week of class, and will focus on combining material from earlier in the semester to solve more complex problems.

Laboratory (25%):

As Biological Chemistry is an experimental science, learning how to work with biomolecules in the lab is just as important as learning the theory in the lecture. Successful completion of the lab (passing grade) is required to pass the course.

Course Grade:

Grades in the course will be assessed according to the following point scheme:

Attendance, Discussion & Homework	9 %
Problem Sets	6 %
Quizzes	10 %
Exam 1	10 %
Exam 2	10 %
Exam 3	10 %
Final Exam	20 %
Lab	25 %
Total	100 %

Final grades in the course will be assigned based on percent completion, as follows:

A/A-: 90-100% B+/B/B-: 78-89% C+/C: 68-78% D: 55-67%

However, both a passing grade (55%+) must be obtained in both the lecture and lab portions of the class to receive a passing grade for the course.

I do not adjust grades to a particular distribution (i.e., a curve), but I may, at my discretion, adjust the grading ranges to better fit individual performance in the course. If at any point in the semester you are concerned about your grade or have any questions, please come see me as soon as possible.

Tentative Spring 2017 Schedule

Week	Lecture Dates	Lecture Topics	Assignments
1	23-Jan	Introduction & Background Introduction to Amino Acids	
	25-Jan		
	27-Jan		
2	30-Jan	Protein Structure Binding Theory	
	1-Feb		
	3-Feb		
3	6-Feb	Protein Function: Enzymes Quantitating Protein Activity	Problem Set 1 Given Out
	8-Feb		Quiz 1 (Amino Acids)
	10-Feb		Problem Set 1 Due
4	13-Feb	Enzyme Inhibition Introduction to Carbohydrates **Test 1**	
	15-Feb		
	17-Feb		Test 1
5	20-Feb	Non-Enzymatic Proteins Metal Centers & Cofactors	
	22-Feb		
	24-Feb		
6	27-Feb	Allostery & Cooperativity	
	1-Mar		Quiz 2 (Carbohydrates)
	3-Mar		
7	6-Mar	Introduction to Nucleic Acids Nucleic Acid Biosynthesis Replication & Repair	Problem Set 2 Given Out
	8-Mar		
	10-Mar		Problem Set 2 Due
8	13-Mar	Gene Regulation & Protein Expression Biotechnology **Test 2**	
	15-Mar		
	17-Mar		Test 2
	20-Mar to 31-Mar	Spring Break	Spring Break
9	3-Apr	Overview of Metabolism Glycolysis Pentose Phosphate	
	5-Apr		
	7-Apr		
10	10-Apr	Citric Acid Cycle Electron Transport Glucose Storage	
	12-Apr		Quiz 3 (Nucleic Acids)
	14-Apr		
11	17-Apr	Glucose Synthesis Introduction to Lipids & Membranes Fatty Acid Degradation & Synthesis	
	19-Apr		
	21-Apr		
12	24-Apr	Amino Acid Synthesis Amino Acid Degradation	Problem Set 3 Given Out
	26-Apr		Quiz 4 (Fatty Acids)
	28-Apr		Problem Set 3 Due
13	1-May	Nucleic Acid Degradation	
	3-May		
	5-May	**Test 3**	Test 3
14	8-May	Integration of Metabolism	
	10-May		
	12-May		