

## BIO 220 Biochemistry

Spring 2009

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Often referred to as the “chemistry of life,” biochemistry represents the study of organisms, cells, and cellular components at the chemical and molecular level. The field of biochemistry seeks to understand the relationship between chemical structure and biological function, chemical reactions that occur in living things (metabolism), and the chemistry involved in storing and transmitting biological information (the last topic is also intimately connected with molecular biology/genetics).

In this intermediate-level course we will consider the structure and function of both nucleic acids and proteins, including an introduction to enzyme kinetics and regulation. We will also review carbohydrates and lipids and discuss aspects of metabolism and signal transduction. This course is intended for science majors who have had an introduction to general and organic chemistry as well as introductory biology<sup>1</sup>. It is designed to be of interest to those students who may pursue scientific research as well as those interested in a career in the health professions. Many of the topics discussed and examples used will relate to human health and disease.

**Class** will meet from 11:30am-12:20pm on Monday, Wednesday, and Friday in Shankweiler 440S. A tentative schedule of lecture topics is attached to this syllabus. Regular class **participation** including working in smaller groups to study examples and problems will account for a percentage of your final grade. Please plan to arrive at lecture on time; frequent tardiness and absenteeism will not be well tolerated. If you must miss class for a legitimate reason, please let me know ahead of time. It is your responsibility to obtain notes and any additional course materials from a classmate. Please note that four class periods are labeled **problem solving** on the lecture schedule. In these classes you will work in small groups on problems related to the preceding lecture material. This is primarily intended to help you apply material and may also serve as good preparation for exams. Only one absence on a problem solving day in lecture may be excused (sorry, no exceptions). We will also engage in problem solving activities in some lab periods (see lab syllabus).

**Reference materials:** The reference textbook is *Lehninger Principles of Biochemistry, 5th edition* (2008) by D.L. Nelson and M.M. Cox. On the lecture schedule, chapters corresponding to topics we will cover throughout the course are listed. The text is best used to reinforce and clarify material discussed in class; I will discuss my recommendations for use of our textbook during the first week of the course. Blackboard, the on-line course utility supported by the

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<sup>1</sup> Please note that I will expect you to be familiar with the material covered in the first semester of organic chemistry as well as relevant introductory material in the biological sciences (i.e. that covered in *BIO 152 Principles III*). If you are concerned about your preparation for this course, please speak with me as soon as possible.

College will also serve as a source for course information; please plan to check our Blackboard course site regularly. Powerpoint slides used in lectures will also be posted on Blackboard for your review *after class*.

Four in-class **exams** will be given on the dates indicated on the lecture schedule. These assessments may be considered cumulative in the sense that we will build on material covered earlier in the course as we move along; however, they will focus on the material presented in lecture on the block of dates indicated. A **cumulative final exam** will be held during Finals Week in May. *Please note that makeup examinations will be only be given in the event of severe illness or family emergency; documentation from an appropriate College official will be required.*

**Laboratory** will meet on Tuesday (section 10), Wednesday (section 11), or Thursday (section 12) at 1:30 pm in Shankweiler 235S. *Please plan to attend your assigned lab section.* The laboratory component of this course will be focused on introducing you to experimental methods and techniques used in biochemical research, through both discussion and application (hands-on). Please refer to the laboratory syllabus and schedule you will receive in the first week of lab.

We will also engage in several activities termed **scientific information explorations** (SIEs), which are designed to help you familiarize yourself with the scientific literature and databases as well as further explore topics introduced in lecture. In the first activity, we will read and discuss an article from the primary literature (a.k.a. journal club) and then you will be given an independent assignment to complete as a follow up to our conversations. The second bioinformatics assignment aims to encourage your use of protein sequence and structural data that is freely available. The final SIE project is designed to help you further your ability to access and evaluate scientific papers, popular science writing, and database information. More details about these SIE assignments will be provided throughout the course.

Weekly **office hours** will be Monday, 2-3:30pm and Thursday 11am-12:30pm. To meet with me at any other time, I ask that you please call or email me to schedule an appointment. I would be happy to talk with you and encourage you to come see me if you have any questions, concerns, or difficulties with the course. Any student with documented disabilities or special needs who requires accommodations in this course should let me know as soon as possible<sup>2</sup>.

**Course grades** will be determined on the basis of several components described above. Contributions to the final course grade will be as shown on the next page:

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<sup>2</sup> *Students with disabilities requesting classroom or course accommodations must complete a multifaceted application/approval process through the Office of Disability Services prior to the development and implementation of an Accommodation Plan. Each Plan is individually and collaboratively developed with the directors or other staff of the following Departments, as appropriate: Academic Resource Center, Counseling Services, Student Health Services, and the Office of Disability Services. If you have not already done so, please contact the appropriate Department to begin a dialogue regarding your academic needs and recommended accommodations, auxiliary aids, and services.*

<u>Component</u>	<u>Notes</u>	<u>Total</u>
Four in-class exams	100 points each	400 points
Final exam		140 points
Participation in lecture	40 points from problem solving	60 points
Laboratory work	L	80 points
Lab notebook	L	120 points
Journal club	S	50 points
Bioinformatics	S	50 points
SIE final project	S	<u>100 points</u>
		1000 points total

Please refer to the lab syllabus (L) and SIE assignment sheets (S) for more specific information regarding each course component. A decile grading scale as follows will be used for the determination of final letter grades: A, 900 points and above; B, 800-899 points; C, 700-799 points; D, 600-699 points; F, 599 points and below. Pluses (+) and minuses (-) may be used to denote the higher and lower end of each range. This scale *may* be adjusted (“curved”) based on overall class performance, but any adjustments made will only raise students’ grades.

**All course requirements are to be performed under the bounds of the Academic Behavior Code.** Please familiarize yourself with this document and understand that a student who violates the Code may receive a failing grade for the course.

**BIO 220 Biochemistry**  
**Lecture schedule**

**Dr. Amy Hark**  
**Spring 2009**

Week	Day	Date	Topic	Readings (reference only)
1	M	1/12	Biochemistry today	Chapter 1
	W	1/14	Biochemistry basics	Chapter 2
	F	1/16	Nucleic acids	Chapters 8, 24
2	M	1/19	MLK Day - NO CLASS	
	W	1/21	Amino acids and protein structure I	Chapters 3, 4
	F	1/23	Protein structure II	Chapters 4, 27
3	M	1/26	DNA function I (replication, repair)	Chapter 25
	W	1/28	DNA function II (repair, transcription)	Chapters 25, 26
	F	1/30	DNA function III (transcription, cont.)	Chapter 26
4	M	2/2	<i>Problem solving</i>	
	W	2/4	<b>EXAM I</b> (focus on material from 1/12 through 2/2)	
	F	2/6	Regulation of gene expression	Chapters 26, 28
5	M	2/9	RNA I	Chapters 8, 26
	W	2/11	RNA II	Chapters 26, 28
	F	2/13	Translation	Chapter 27
6	M	2/16	Studying proteins	Chapters 3, 9
	W	2/18	Protein function I (structural proteins, antibodies)	Chapters 4, 5
	F	2/20	Protein function II (hemoglobin)	Chapter 5
7	M	2/23	<i>Problem solving</i>	
			<b>Journal Club questions due (via email, by 11:30am)</b>	
	W	2/25	<b>EXAM II</b> (focus on material from 2/6 through 2/23)	
	F	2/27	Protein function III (enzymes)	Chapter 6
			<b>Lab notebooks due (outside NSB 225, by 11:30am)</b>	
SPRING BREAK				
8	M	3/9	Enzyme kinetics	Chapter 6
	W	3/11	Enzyme regulation	Chapter 6
	F	3/13	Lipids	Chapters 10, 11
			<b>SIE assignment 1 (journal club) due by 11:30am</b>	
9	M	3/16	Carbohydrates	Chapter 7
	W	3/18	Glucose metabolism I	Chapters 13, 14
	F	3/20	Glucose metabolism II	Chapters 14, 15
10	M	3/23	Glucose metabolism III	Chapter 15
	W	3/25	Citric acid cycle	Chapter 16
	F	3/27	<i>Problem solving</i>	
			<b>SIE assignment 2 (bioinformatics) due by 11:30am</b>	

Week	Day	Date	Topic	Readings (reference only)
11	M	3/30	<b>EXAM III</b> (focus on material from 2/27 through 3/27)	
	W	4/1	Lipid catabolism	Chapter 17
	F	4/3	Amino acid catabolism	Chapter 18
12	M	4/6	Oxidative phosphorylation	Chapter 19
	W	4/8	Hormones and signaling I	Chapters 11, 12, 23
	F	4/10	Easter Recess - NO CLASS	
13	M	4/13	Easter Recess - NO CLASS	
	W	4/15	Hormones and signaling II	Chapters 12, 15
	F	4/17	Biosynthesis	Chapters 21, 22
14	M	4/20	Metabolic states I	Chapter 23
	W	4/22	Metabolic states II	Chapter 23
	F	4/24	<b>Problem solving</b> <b>Lab notebooks due (outside NSB 225, by 11:30am)</b>	
15	M	4/27	<b>EXAM IV</b> (focus on material from 4/1 through 4/24)	
	W	4/29	Vitamins (review)	
	F	5/1	<b>SIE assignment 3 (final project) due by 11:30am</b> (no class)	

The **FINAL EXAM** will be held during finals week and is scheduled by the Registrar mid-semester. This assessment will be cumulative, covering all lecture and lab material.

*Please note that this schedule represents an outline of topics to be covered and may be subject to change. Please check Blackboard regularly for assignment updates and general course information.*