Biochemistry: The Molecular Basis of Life

Bennington College - Spring 2010

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  Office: 203 Dickinson
  Office Hours: Tuesday 1:30 - 3, Wednesday 1:30 - 3
  Lecture: Wed. 10:10 & Fri. 2:10
  Web-Site: http://faculty.bennington.edu/~bullock/Biochem

Description. Biochemistry is an intermediate chemistry course in which you will apply fundamental principles from general and organic chemistry to understand the molecular processes that characterize life. Biochemistry is a broad discipline that is growing rapidly in its scope - new developments and discoveries are being made everyday. The goal of this class will be to give you a solid background with which you can appreciate the latest developments and research papers. Because of the broad scope of the discipline it will be impossible for us to cover all of the topics in your text. Rather, we will focus our attention on a few key concepts and elaborate on more fundamental principles in that context. Most of our time will be spent on issues concerning bioenergetics and metabolism.

The class will have lecture/discussion meetings at which we will cover the major concepts of reading assignments from your text. Occasionally outside readings will also be made available. Come prepared to ask questions and otherwise fully participate in these meetings. There will be occasional problem sets that cover the material in the readings or related ideas – we will use these as the starting point for many of the discussions.


You will also want to have access to a good general chemistry textbook to review topics such as thermodynamics, equilibrium, acid-base chemistry and chemical kinetics.

Assessment. The assessment of your performance in this course will be based on the following criteria:

Attendance & Class Participation - active participation in the lecture/discussions is absolutely mandatory; the quality of your work in this area will be addressed in narrative evaluations.

Review assignments – the review assignments will serve to reinforce concepts covered in class and to expose you to new issues and applications relevant to the reading or lecture material. No late assignments will be accepted.
Independent research – you will have two independent research projects, both of which will entail written and oral presentations.

1. **Adopt-an-Enzyme.** Identify an enzyme involved in a biological process of interest to you (photosynthesis, metabolism, cell division, etc.). Research its structure and mechanism of action and discuss these aspects of its chemistry in your reports. An extremely important aspect of this work will be to include discussions of original experimental data that led to the current theory or theories of the catalytic properties of your enzyme. You will need to identify your enzyme by March 12; your paper will be due April 9. Presentations will take place the following week (April 21 & 23)

2. **Research Article Review.** Identify a recent (2008 – 10) article (not a communication) appearing in the either *The Journal of the American Chemical Society* or *Biochemistry*. You will write a paper in which you summarize the results of the paper (including a detailed discussion of supporting data) and include appropriate background material to develop a context for the work. You will need to identify a paper by April 23; your written paper will be due May 21. Presentations will take place on May 26 and 28.

*Examinations* – there will be one written mid-term exam (on March 26) and a final (on June 2). These will be timed (within reason) closed book exams and will cover the topics raised in class and in review assignments.

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**Calendar.** A tentative weekly schedule is provided below.

<table>
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<tr>
<th><strong>Week of:</strong></th>
<th><strong>Topic (Chapter in Lehninger)</strong></th>
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<tbody>
<tr>
<td>February 24</td>
<td>Intro &amp; A Case Study: Mechanism of Muscle Contraction (Chapt. 5.3)</td>
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<td>March 3</td>
<td>Protein Structure &amp; Function (Chapter 4)</td>
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<td>March 10</td>
<td>Enzymes &amp; Enzyme Kinetics (Chapter 6)</td>
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<tr>
<td>March 17</td>
<td>Enzymes &amp; Enzyme Kinetics (Chapter 6)</td>
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<td>March 24</td>
<td><strong>Midterm Exam</strong> (March 26) – Read Chapt. 13</td>
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<td>March 31</td>
<td>Glycolysis (Chapter 14)</td>
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<td>April 7</td>
<td>Glycolysis &amp; Metabolic Regulation (Chapter 14, 15)</td>
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<td>April 14</td>
<td>Long Weekend</td>
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<td>April 21</td>
<td><strong>Enzyme Presentations</strong></td>
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<td>April 28</td>
<td>The Citric Acid Cycle (Chapter 16)</td>
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<tr>
<td>May 5</td>
<td>The Citric Acid Cycle (Chapter 16)</td>
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<tr>
<td>May 12</td>
<td>Oxidative Phosphorylation (Chapter 19)</td>
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<tr>
<td>May 19</td>
<td>Oxidative Phosphorylation (Chapter 19)</td>
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<td>May 26</td>
<td><strong>Research Article Presentations</strong></td>
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<tr>
<td>June 2</td>
<td>Final Exam</td>
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This list of topics is subject to change and will be updated as necessary on the course webpage.