BIOCHEMISTRY

CHEM 3281.51 – Spring 2010

General Information
Prerequisite: Organic Chemistry II (CHEM 2262)
Room DH 1105
Time M 5:25 – 8:00 p.m.
Instructor: Dr. Mihaela Leonida
    Dickinson Hall, Room 4455, Tel.: (201) 692-2338
    email: mleonida@fdu.edu; website: http://www.fdu.edu/~mihaela
Office hours: M and Th 4:00 – 5:00 p.m. and by appointment.

Course Description and Objectives
Biochemistry is a course suitable for students planning a career in the medical field, veterinary medicine, pharmacy, graduate school in sciences, clinical laboratory, or teaching science. Students are expected to have basic knowledge of general chemistry, organic chemistry, and biology. Students are introduced to chemical compounds of biological importance and to several metabolic pathways.

Textbook
R. H. Garrett and C. M. Grisham,

Other useful books (optional):

Useful Links:
The Protein Data Bank (http://www.pdb.org)
It is a worldwide repository for the processing and distribution of 3-D biological macromolecular structure data. You can find there 18566 structures (as of August 27, 2002).

ExPASy Enzyme (http://www.expasy.ch/enzyme/)
This is a repository of information related to the nomenclature of enzymes.

Clear summary of enzyme mechanisms.

Select “Tables” for an excellent series of tables that review and summarize amino acid metabolism, bioenergetics, carbohydrate metabolism, lipid metabolism, and purine and pyrimidine metabolism.
Signal Transduction
(http://www.kumc.edu/biochemistry/bioc800/siglora.htm)
Signal transduction from a medical viewpoint, including G proteins.

OncoLink (http://www.oncolink.upenn.edu)
Site for information on cancer.

Molecular Biology Today: Molecular Biology Protocols
(http://www.horizonpress.com/gateway/protocols.html)
A comprehensive directory covering a wide range of laboratory protocols used in biochemical research.

The Polymerase Chain Reaction (http://www.horizonpress.com/pcr)
A comprehensive directory for the polymerase chain reaction (PCR) and related techniques

GOLD: Genomes On Line Database
(http://geta.life.uiuc.edu/~nikos/genomes.html)
Catalogs and links to completed genome sequences and prokaryotic and eukaryotic organisms

Fatty Acid Synthesis and Modification
(http://medlib.med.utah.edu/NetBiochem/FattyAcids/outline.html)
Outline of fatty acid metabolism

Photosynthesis Center
(http://photoscience.la.asu.edu/photosyn/default.html)
Collection of educational resources and research links related to photosynthesis

Outline of glycolysis and respiration

Grading Policy

Final Exam 200
Exam I 150
Exam II 150
Quizzes 100
Simulation 105
Discussion Board 130
In-class discussion 65
Homework 100

Total 1000 points

Exams: The exams are multiple choice, in-class exams. Students who score 120 or better on exam I and II can skip that part for the final if they want.

Quizzes: The first 10 minutes of four lectures will be reserved for a quiz on a given topic.
The quizzes will be announced one week in advance.

**Homework:** Will be collected during the class following the week when it was assigned. Late homework will not be accepted.

**Cooperative learning mode:** Study groups of not more than four people will be formed. The composition of a group will stay the same throughout the semester. If the group has a positive gradient after the second exam (each student has a higher grade than on the first exam), everybody in the group gets 5 more points for that exam. The same applies to the final exam.

**Simulation:** The simulation of a kinetic experiment (for an enzyme) will be installed on five computers in Computer Lab C. Students will work in groups of two. Each group will receive their own set of data. Excel skills are required.

**Discussion:** A good part of the grade comes from the discussion, both in-class (science background) and on the Discussion Board (discussion of recent literature pertinent to topics discussed in class).

**Attendance:** Although attendance is not mentioned in the grading policy, it is encouraged and is a condition for in-class discussion. Entrance to the lecture room is prohibited once the class has started.

**Grade Distribution:** The course will not be graded on a curve.

<table>
<thead>
<tr>
<th>Score</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>&gt;900</td>
<td>A</td>
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<tr>
<td>870-899</td>
<td>A-</td>
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<tr>
<td>840-869</td>
<td>B+</td>
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<tr>
<td>810-839</td>
<td>B</td>
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<tr>
<td>780-809</td>
<td>B-</td>
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<tr>
<td>740-779</td>
<td>C+</td>
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<tr>
<td>700-739</td>
<td>C</td>
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<tr>
<td>650-699</td>
<td>C-</td>
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<tr>
<td>600-649</td>
<td>D</td>
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<tr>
<td>&lt;600</td>
<td>F</td>
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**Student Learning Outcomes:** Upon successful completion of this course the student will be able to:
- think critically (OA 1)
- make connections (OA 5)
- become familiar with chemical compounds of biological importance (OA 1)
- acquire an understanding of fundamental metabolic pathways (OA 1)
- effectively express themselves in writing (OA 3)
- locate and use information (OA 6)
- read and understand a paper published in the field of biochemistry (OA 4, OA 6)
- discuss and answer questions pertaining to a scientific paper they read (OA 6)
- perform a simulated experiment in the field of enzyme kinetics (OA 1, OA 2)
- write a proper lab report on a simulated experiment and critically discuss their data (OA 3, OA 4)
- work effectively in teams, communicate, share tasks and data (OA 2, OA 4).

**Cheating:** Consult the University’s policy concerning academic integrity and make sure you abide by it ([http://www.fdu.edu/studentlife/2009metro/1927.pdf](http://www.fdu.edu/studentlife/2009metro/1927.pdf)).

**CHEM 3281 – BIOCHEMISTRY**

Tentative Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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</table>
| 1    | - Cells  
|      | - Biomolecules and biological macromolecules  
|      | - Water: the medium of life  
|      | - pH  
|      | - The Henderson-Hasselbalch equation  
|      | - Titration curves  
|      | - Amino acids  |
| 2    | - Reactions of amino acids. The peptide bond  
|      | - Chirality of amino acids  
|      | - The primary sequence of amino acids  
|      | - Experimental methods for protein sequencing  
|      | - Secondary structure of proteins  |
| 3    | - Protein folding. Prions  
|      | - Tertiary and quaternary structure  
|      | - Kinetics of enzyme-catalyzed reactions  
|      | - Enzyme Inhibition  |
| 4    | - Mechanisms of enzyme action  
|      | - Regulation of enzyme activity  
|      | - Review for exam I  |
| 5    | - Thermodynamics of biological systems  
|      | - ATP – an intermediate energy-shuttle molecule  
<p>|      | - Exam I  |
| 6    | - Carbohydrates  |</p>
<table>
<thead>
<tr>
<th></th>
<th>Monosaccharides. Oligosaccharides.</th>
<th>Polysaccharides and their functions</th>
<th>Glycolysis</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>Gluconeogenesis</td>
<td>TCA cycle</td>
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<tr>
<td>8</td>
<td>Electron transport</td>
<td>Complexes I, II, III, and IVh</td>
<td>Oxidative phosphorylation</td>
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<td></td>
<td>Review for exam II</td>
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<tr>
<td>9</td>
<td>Photosynthesis</td>
<td>Exam II</td>
<td></td>
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<td>10</td>
<td>Biological membranes</td>
<td>Fluid mosaic model</td>
<td>Transport across membranes</td>
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<td>11</td>
<td>Lipid metabolism</td>
<td>β oxidation</td>
<td>Fatty acid biosynthesis</td>
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<tr>
<td>12</td>
<td>Amino acid metabolism</td>
<td>Integration of metabolism and hormone action</td>
<td>Structure of nucleic acids and nucleoproteins</td>
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<tr>
<td>13</td>
<td>DNA</td>
<td>Information transfer: replication, recombination and repair</td>
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<tr>
<td>14</td>
<td>RNA</td>
<td>Protein synthesis</td>
<td>Review for the final exam</td>
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