Advanced Biochemistry
CHEM 4753/5753

Helen Zgurskaya
Department of Chemistry and Biochemistry
University of Oklahoma

ADVANCED BIOCHEMISTRY
CHEM 4753/5753, Fall 2012

Instructor
Dr. Helen Zgurskaya
Phone
325-1678
Email
elenaz@ou.edu
Office
SLSRC 3610
Lectures
TR 10:30 – 11:45 AM, PhSc 108.
Office Hours
TR 1:00 - 2:00 PM

TEXTBOOK


Lectures will roughly follow the text, and students are required to have their own copy. Lecture outlines, etc. will be posted on the Course Web site for CHEM 4753/5753 on learn.ou.edu.

Other texts and that may also be helpful follow:

OBJECTIVES

This course will provide a continuation of the material presented in CHEM 3653 Introduction to Biochemistry. As a result, the introductory course is a prerequisite. The course will build on the student's general background in biochemistry, and will consider topics that are more global with respect to their application to the metabolic pathways. Thus, the topics of energy generation and utilization, structure and catalysis, and control will be stressed overall.

The class will move at a rapid pace because of the amount of material to be covered, and thus one should try to stay slightly ahead of the lecture schedule with respect to reading assignments. Staying ahead will also allow the student to derive most from the lectures.

ESTIMATION OF GRADE

Grades will be calculated based on the student’s performance on a number of examinations, including quizzes, hourly exams and a final. The final will be cumulative, i.e. will contain information from the entire course. A summary of examinations and their value is provided below:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes /Clickers/ Problem sets</td>
<td>200</td>
</tr>
<tr>
<td>Midterm</td>
<td>200</td>
</tr>
<tr>
<td>Final*</td>
<td>200</td>
</tr>
<tr>
<td>Total</td>
<td>600</td>
</tr>
</tbody>
</table>

Quizzes may or may not be announced. It is important to have a calculator for quizzes, but notes or other aids are not permitted. THERE WILL BE ABSOLUTELY NO MAKE-UPS FOR QUIZZES!

Hourly exam dates and the date of the final exam are provided below. Exams will include material covered in lecture and from reading assignments. MAKE-UP EXAMS WILL BE GIVEN ONLY IF THE INSTRUCTOR HAS BEEN NOTIFIED PRIOR TO THE EXAM AND A PHYSICIAN'S NOTE, ETC. IS PROVIDED!

*The standardized American Chemical Society exam in Biochemistry will be used as the final exam and will cover material presented in this class and the pre- and co-requisite courses, CHEM 3653 and CHEM 3753.

In the instance a student’s grade is near a grade cut-off, e.g. A/B, the instructor will take class participation into account for possible grade adjustments.
CODES AND POLICIES OF BEHAVIOR POLICY

Each student should acquaint herself or himself with the Universities' codes, policies, and procedures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination based on physical handicap.

REASONABLE ACCOMMODATION POLICY

Any student in this course who has a disability that may prevent her or him from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

LECTURE TOPICS AND SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug.</td>
<td>21 Introduction; How to Study Metabolism – Overview; Chemical Logic; Classification of Reactions</td>
<td>Chapter 1, 16</td>
</tr>
<tr>
<td>23</td>
<td>Glycolysis; Pentose Phosphate; Glycogen Metabolism</td>
<td>Chapters 17,18,23</td>
</tr>
<tr>
<td>28</td>
<td>TCA cycle</td>
<td>Chapters 21</td>
</tr>
<tr>
<td>30</td>
<td>Biological Membranes; Transport across Membrane;</td>
<td>Chapter 12, 20</td>
</tr>
<tr>
<td>Sep.</td>
<td>4 Oxidative Phosphorylation; Synthesis of ATP; Photosynthesis</td>
<td>Chapter 20</td>
</tr>
<tr>
<td>6</td>
<td>Gluconeogenesis; Cori Cycle; Synthesis of Nucleotides</td>
<td>Chapter 22-24, 28</td>
</tr>
<tr>
<td>11</td>
<td>Fatty Acid Metabolism; Ketone Body Formation and Utilization</td>
<td>Chapter 25</td>
</tr>
<tr>
<td>13</td>
<td>Hormones: Endocrine, Paracrine; Autocrine; Steroids</td>
<td>Chapter 19</td>
</tr>
<tr>
<td>18</td>
<td>Signal Transduction; G Protein-Coupled Receptors Tyrosine Kinases</td>
<td>Chapter 19</td>
</tr>
<tr>
<td>20</td>
<td>Chemical Energy: Generation and Storage; High Energy Compounds; Phosphate Transfer Potential</td>
<td>Chapter 16</td>
</tr>
<tr>
<td>27</td>
<td>Cancer Metabolism</td>
<td></td>
</tr>
<tr>
<td>Oct.</td>
<td>2/4</td>
<td>Preparation/Exam 1</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>-------------------</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Protein Structure, Folding, Chaperones</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Enzyme Kinetics: Nomenclature, Kinetic Mechanisms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cleland notation; Direct and Coupled Enzyme Assays</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enzyme Kinetics; Steady State Approximation and Relaxation rate; Michaelis-Menten equation</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>Inhibition as a Mechanistic Tool; Drug Design</td>
</tr>
<tr>
<td>18/23</td>
<td></td>
<td>Origins of Catalysis; Transition State Theory; Principles; General Base/Acid; Metal; Entropy; Electrostatic; Covalent</td>
</tr>
<tr>
<td>25/30</td>
<td></td>
<td>Enzyme Mechanisms; Serine Proteases; Zymogens</td>
</tr>
<tr>
<td>Nov.</td>
<td>1</td>
<td>Regulation; Homeostasis; Metabolic Flux; Mass Action Ratio</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Regulation; Control of Enzyme Activity; Cooperativity; Covalent Modifications</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Integration of Metabolism; Small Molecule Effectors; Organ Specialization</td>
</tr>
<tr>
<td>13/15</td>
<td></td>
<td>Information Metabolism: Genetic Information, Central Dogma; DNA replication</td>
</tr>
<tr>
<td>20/27</td>
<td></td>
<td>Chromatin structure and gene expression</td>
</tr>
<tr>
<td>29</td>
<td></td>
<td>Synthetic genome</td>
</tr>
<tr>
<td>Dec.</td>
<td>4</td>
<td>Review</td>
</tr>
</tbody>
</table>

Dec. 12 (W)    Comprehensive Final Exam – 8:00-10:00 am

The instructor reserves the right to change by addition and/or subtraction any and/or all materials contained in this syllabus. This includes, but is not limited to, course content, assignments, due dates, and portion(s) of the grade assigned to individual items within the course.
Graduate Students
CHEM 5753

Additional assignment:
Poster or presentation on a selected research paper