

## BIOCHEMISTRY II

Chem 4610 (CRN 14137), Biol 4930 (22767), Chem 6610 (CRN 14138)

Spring 2019

Prerequisites:	Chem 1212K, 2410/3410, 4600 (grade C or better in Organic II and Biochemistry I)
Instructor:	Dr. Gigi B. Ray, 212 Courtland North, <a href="mailto:gbray@gsu.edu">gbray@gsu.edu</a> , Tel. (404) 413-5540
Lecture:	MW 3:30 pm – 4:45 pm in Langdale 223 (3-credit hour course) <b><u>Students are expected to come to class having READ the textbook material and PPT notes for that day and REVIEWED relevant topics from Biochemistry I</u></b>
Help Sessions Optional Strongly Recommended	<b><u>Wednesdays 4:50 – 5:30 pm &amp; Fridays 1:00 – 2:00 pm (location TBA)</u></b> **The instructor will be available twice a week all semester for review sessions to answer questions on current material. <i>Times and location subject to change.</i> <b><i>This is the best time to ask questions on specific homework problems and lecture topics.</i></b> Regularly work problems at home, come frequently with questions, and improve your understanding and skills in solving biochemistry problems.
Office Hours:	<b>Mondays &amp; Wednesdays 1:00 – 2:00 pm, and Fridays 2:30 – 3:30pm</b> Instructor will be available to meet with students individually during office hours. Students must bring their textbook and lecture notes. <b><i>Students who wish to discuss exam absences or other individual concerns need to schedule an appointment outside of class time during office hours.</i></b> Students desiring to discuss career plans, can request to schedule an appointment at other times. <b>Office Hours are suspended the day of the Exam (no questions will be answered).</b>
Text (Required): 7 <sup>th</sup> Edition or 8 <sup>th</sup> Edition	<b><u>Textbook (required)</u></b> <b><i>Biochemistry, 8th Ed.</i></b> , Berg, J.M.; Tymoczko, J.L.; Gatto, G.J.; Stryer, L., (2015), W.H. Freeman: New York, NY. [ISBN 13:978-1-4641-2610-9] <i>Hardcover or Looseleaf</i> <b><u>Workbook (strongly recommended):</u></b> Includes learning objectives, self-assessment problems with solutions, and expanded solutions to end-of-chapter textbook problems: <b><i>Biochemistry Student Companion, 8th Ed.</i></b> , Rhodes, C.; Fertuck, K.; Josephy, D.; Koeppe, R.E., (2015), W.H. Freeman: New York, NY. [ <i>Paperback</i> ]
Course Objectives:	A comprehensive and integrated review of modern biochemistry with emphasis on metabolism and biosynthesis of carbohydrates, fatty acids, lipids, amino acids, and nucleotides. Regulation and integration of metabolism will be explored, including hormones and signal transduction. DNA replication and recombinant DNA technology will be examined. Molecular basis for human diseases such as diabetes will be discussed, as well as applications of current techniques in biological chemistry. <b><i>PRIOR to taking Biochemistry II, working knowledge of Core Biochemistry I topics is expected (Chapters: 1 – 4, 7 – 13, 15 – 18): Structure and Function of Proteins, Carbohydrates, Lipids and Nucleic Acids; Enzyme Function and Regulation; Bioenergetics and Glucose Catabolism (Glycolysis, Citric Acid Cycle, Oxidative Phosphorylation).</i></b>
Learning Outcomes:	Course will focus on <b><i>developing an in-depth understanding of biochemical principles and processes that govern the structure, interactions, functions &amp; transformations of biomolecules.</i></b> Upon successful completion of the course students will have the tools to be able to apply their knowledge of biochemistry to <b><i>understand the causes of human diseases</i></b> , as well as <b><i>applications of biochemistry in medicine and the environment.</i></b>

<p>Grading for <b>Undergraduate</b> Students:  <b>Chem 4610</b> <b>Biol 4930</b></p>	<p><b>Undergraduates:</b> There will be four class exams worth 100 points each and a comprehensive final exam worth 150 points. The final exam is mandatory and it will not be dropped under any circumstance. Exams will be partially multiple choice and partially short answer questions (pathways, mechanisms, explanatory essays). The class exam with the lowest grade will be dropped (not exam 4) before totaling the remaining possible points out of 450 (this is 100% for Undergraduate students). <b>Semester Grade = [(sum 3 best class exams + final exam) / 450] * 100</b></p>
<p>Grading for <b>Graduate</b> Students:  <b>Chem 6610</b></p>	<p><b>Graduates:</b> There will be four class exams worth 100 points each and a comprehensive final exam worth 150 points. The final exam is mandatory and it will not be dropped under any circumstance. Exams will be partially multiple choice and partially short answer questions (pathways, mechanisms, explanatory essays). Graduate students will have additional take-home writing assignments worth 50points. The class exam with the lowest grade will be dropped (not exam 4) before totaling the remaining possible points out of 500 (this is 100% for Graduate students). <b>Semester Grade = [(sum 3 best class exams + final exam + written work)/500] * 100</b> <b>Note: B or higher needed by Graduates students for course to count towards degree.</b></p>
<p>Grading Scale:</p>	<p><b>A+ 97% A 90% A- 87% B+ 84% B 80% B- 77% C+ 74% C 70%</b> <b>C- 67% D 60% F &lt;60%</b></p>
<p>Course Policies:</p>	<ol style="list-style-type: none"> <li>1) <b><u><a href="#">NO MAKE-UP or RESCHEDULING OF EXAMS (before or after exam date &amp; time) will be carried out under ANY CIRCUMSTANCE.</a></u></b> <b><u><a href="#">If you miss a class exam for ANY REASON, that is your dropped grade. The final exam MUST be taken 1:30 – 4:00pm Monday May 6<sup>th</sup>.</a></u></b></li> <li>2) <b>ACS Biochemistry Exam (Biochemistry I &amp; II topics, worth 100pts) will be given as a practice final exam on April 29<sup>th</sup> and is mandatory for all students.</b> This grade can replace an in-class exam grade if it improves the student's overall grade. It cannot replace a missed exam grade.</li> <li>3) Students are <u>required to show (and leave) their student identification on the desk</u> in order to take and submit an exam. Exams will be graded ONLY if the student's picture I.D. is shown (GSU ID card or driver's license). The Instructor reserves the right to seat or move students during exams.</li> <li>4) Cell phones, calculators, tablets, laptops, ALL other electronic devices are NOT allowed out on classroom desks during exams. Phones must be <u>OFF</u> during all exams and during class. If phones ring during an exam, points may be deducted.</li> <li>5) Class PowerPoint notes for ALL sections will be posted on one iCollege page: <b>BIOCHEMISTRY II XLS GROUP SR SPRING SEMESTER 2019</b> Some class notes will only be given on the board during class. <b><u><a href="#">Changes in schedule/topics will be announced in iCollege, so check this regularly.</a></u></b></li> <li>6) <b><u>Students are responsible for checking their exam scores posted on iCollege. Any discrepancies need to be addressed within 1 week after grades have been posted on iCollege.</u></b> Changes will not be made at the end of the semester.</li> <li>7) Tuesday Mar 5<sup>th</sup> is the last day to withdraw from the class and receive a "W". You are responsible for withdrawing before the deadline if you need to do so. If more than one exam is missed for legitimate, non-academic reasons, you should seek a hardship withdrawal or an incomplete. If you do not withdraw and miss the final exam, or more than one class exam, then zeros will be assigned for these grades.</li> </ol> <p>The University requires that faculty members must, on a date after the mid-point of the course to be set by the Provost (or his designee):</p> <ol style="list-style-type: none"> <li>1. Give a WF to all those students who are on their rolls but no longer taking the class.</li> <li>2. Report the last day the student attended or turned in an assignment.</li> </ol>

<p>Suggestions for how to do well in Biochemistry:</p>	<p><b><u>Biochemistry cannot be learned overnight, do NOT wait till the end to study</u></b></p> <ol style="list-style-type: none"> <li>1) Students are strongly encouraged to carefully READ and STUDY the day's topic in the textbook and lecture notes BEFORE coming to class, as well as REVEIWING relevant material from Biochemistry I in advance.</li> <li>2) <b><u>Attendance at all classes is crucial to the student's success in this course.</u></b> Students are encouraged to <b>download the lecture notes from iCollege before class.</b> Answers to blanks in PPT notes will ONLY be available during class. <b>Some notes will be given only on the board.</b> <u>Class roll will be taken on some days.</u></li> <li>3) <b>Announcements</b> will be posted on iCollege, so please check on a daily basis, and between class meetings.</li> <li>4) Students are responsible for all material in assigned sections of the textbook (including problems) and all material on PPT notes, even if not discussed in class. <b>During class the focus will be on in-depth discussion of the more complex topics and on solving biochemical problems.</b> Students are responsible for all notes provided on the board during class.</li> <li>5) <b>Biochemistry II is an advanced course, so students are expected to know and be able to use topics covered in Biochemistry I,</b> even if quickly reviewed or not discussed in detail in Biochemistry II. All students must take the ACS Biochemistry exam, which covers material from the entire textbook (Chapters 1 – 30).</li> <li>6) <b>At the start of Biochemistry II, students are expected to already be familiar with the structure and function of biomolecules: proteins, carbohydrates, lipids and nucleic acids (chapters 2, 4, 11, 12), enzymes (chapter 8, sections 9.1, 9.2, 10.2, 10.3), bioenergetics (chapter 15), and glucose catabolism (sections 16.1, 17.2, chapter 18).</b></li> <li>7) Prior to Unit 2 (carbohydrate metabolism) and Unit 3 (lipid metabolism), <b>students are strongly encouraged to review <u>Glycolysis, Citric Acid Cycle, and Bioenergetics at home</u>,</b> since these two pathways and energy considerations play a central role throughout metabolism. <b>In particular review text sections 16.1 and 17.2, and chapter 15.</b></li> <li>8) Chapter outlines will be posted specifying topics covered from textbook. <b>Specific problems will be assigned for each chapter</b> from the <b><u>workbook self-test questions and problems</u></b>, and the <b><u>textbook end-of-chapter problems</u></b>. It is recommended that problems be tried in this sequence for each chapter. <i>Solutions with explanations to all problems (including those in textbook) are available in the workbook.</i> <b>The best way to prepare for exams is to test your knowledge by regularly working problems throughout the semester.</b> Don't wait till the end of the chapter to work problems. <b><u>The exam is not a good place to do problems for the first time!</u></b></li> <li>9) Students are strongly encouraged to keep up with the material, read the text, review the instructor's notes, make their own notes, and do homework problems regularly after class and prior to the next class, as well as attend reviews often and ask questions. <b><u>Material from each class is often used in next class,</u></b> <b><u>so STUDY Biochemistry DAILY!</u></b></li> </ol>
<p>Cheating:</p>	<p>All tests and coursework must represent your individual, unaided efforts. To receive or offer information during an examination is cheating. The use of unauthorized supplementary materials or any electronic device during tests is also cheating.</p> <p><b><u>A student who cheats on an exam will receive a zero for that exam, which cannot be dropped as the lowest grade.</u></b> Any suspected offenses may also be referred to the Department Chair for appropriate action.</p> <p>The Department of Chemistry follows the university policy on academic honesty published in the "Faculty Affairs Handbook" and the "On Campus: The Undergraduate Co-Curricular Affairs Handbook."</p>

Date	Day	Chapter	<i>Studying Proteins, Immunology, Signal Transduction</i>	No.
Jan 14	M	3	Introduction to Course, Exploring Proteins (review <i>Protein Structure - Chapter 2 at home</i> )	1
Jan 16	W*	14	Signal Transduction: G-protein Coupled Receptors (GPCR), Adenylate Cyclase	2
<b>Jan 21</b>	<b>M</b>	(12)	<b>Martin Luther King Holiday, no class</b> (review <i>Chapter 12 at home</i> )	
Jan 23	W*	14	Receptor Tyrosine Kinase & Insulin, Epidermal Growth Factor	3
Jan 28	M	13,14	Ion Transport through Membranes, Ion Channel Linked Receptors	4
Jan 30	W*	34	Immunology: Antibodies, T-cell Receptors, MHC	5
<b>Feb 4</b>	<b>M</b>		<b>Exam 1 – Material from Chapters 3, 13, 14, 34, (2, 12)</b>	<b>6</b>
			<i>Carbohydrate Metabolism and Regulation</i>	
Feb 6	W*	16 (11,15)	Gluconeogenesis, Bioenergetics and Glycolysis Review (review text Chapters 11,15,16.1 & 10.3; PPTs 11.1,15.1,16.1 at home)	7
Feb 11	M	10,16	Enzyme Regulation and Glycolysis Regulation	8
Feb 13	W*	21	Glycogen Metabolism (review PPT 11.2 at home)	9
Feb 18	M	21	Allosteric & Hormonal Regulation of Glucose Metabolism	10
Feb 20	W*	20,16	Pentose Phosphate Pathway, Galactose/Fructose Metabolism	11
Feb 25	M*	20	Coordination of PPP and Glycolysis, Reactive Oxygen Species	12
<b>Feb 27</b>	<b>W</b>		<b>Exam 2 – Material from Chapters 10, 16, 20, 21, (11, 15)</b>	<b>13</b>
			<i>Lipid Metabolism and Regulation</i>	
Mar 4	M	17	Pyruvate Dehydrogenase Complex Mechanism (review <i>Citric Acid Cycle text section 17.2 and PPT 17.1 at home</i> )	14
<b>Mar 5</b>	<b>Tues</b>		<b>Last day to Withdraw and possibly receive a W</b>	
Mar 6	W*	17,18	Citric Acid Cycle and PDHC Regulation, Mitochondrial Shuttles	15
Mar 11	M	22	Fatty Acid Catabolism and Ketone Bodies	16
Mar 13	W*	26	Cholesterol Biosynthesis and Transport	17
<b>Mar 18–22</b>	<b>M-F</b>		<b>Spring Break, no class</b> (review <i>fatty acid &amp; cholesterol metabolism</i> )	
Mar 25	M	22,26	Fatty Acid Biosynthesis, and Regulation of Lipid Metabolism	18
Mar 27	W*	27	Diabetes Mellitus – Integration of Carbohydrate & Lipid Metabolism	19
<b>Apr 1</b>	<b>M</b>		<b>Exam 3 – Material from Chapters 17, 22, 26, 27, (12, 18)</b>	<b>20</b>
			<i>Nitrogen Metabolism: Amino Acids, Nucleotides, DNA</i>	
Apr 3	W*	23	Protein Turnover, Nitrogen Transport and Urea Cycle	21
Apr 8	M	23	Amino Acid Catabolism, Regulation, Fates of Carbon Skeletons	22
Apr 10	W*	24	Amino Acid Biosynthesis and Carbon Donors: SAM, THF	23
Apr 15	M	25,10.1	Nucleotide Biosynthesis: Ribonucleotides, Deoxyribonucleotides	24
Apr 17	W*	28,5 (4)	DNA Replication and Biotechnology – Sequencing, PCR, RT (review DNA structure and function – text Chapter 4 and 28 at home)	25
Apr 22	M*	5,9	Cloning – Recombinant DNA Technology Restriction Enzymes and Gene Expression	26
<b>Apr 24</b>	<b>W</b>		<b>Exam 4 – Material from Chapters 23, 24, 25, 28, 5, (4)</b>	<b>27</b>
<b>Apr 29</b>	<b>M</b>		<b>Biochemistry ACS Exam – Practice Final Exam (required)</b>	<b>28</b>
May 1,3	W, F		Optional Final Exam Reviews	
<b>May 6</b>	<b>Mon</b>	<b>1:30 – 4:00 pm</b>	<b>Biochemistry II – Comprehensive Final Exam</b> (Chapters 1 – 18, 20 – 28, 34) <b>Time: 1:30 pm – 4:00 pm</b>	