

BIOCHEMISTRY II

Chem 4610 (CRN 13906), Biol 4930 (20616), Chem 6610 (CRN 13907)

Spring 2020

Prerequisites:	Chem 1212K, 3410, 4600 (grade C or better in Organic II and Biochemistry I)
Instructor:	Dr. Gigi B. Ray, Courtland North 212, gbray@gsu.edu, Tel. (404) 413-5540
Lecture:	MW 3:30 pm – 4:45 pm in Petit Science Center 124 (3-credit hour course) <u>Students are expected to come to class having READ the material for that day and REVIEWED relevant topics from Biochemistry I</u>
Optional Review Sessions (Breakout) Biochemistry II Group Office Hours	Mondays & Wednesdays 4:45 – 5:30 pm in Petit Science Center 362 **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> <i>This is the best time to ask questions on specific homework problems and lecture topics.</i> Regularly work problems at home, come frequently with questions, and improve your understanding and skills in solving biochemistry problems.
Office Hours: Courtland North room 212	Mondays 12:30 – 2:30 pm, and Fridays 2:00 – 3:00pm Instructor will be available to meet with students individually during office hours. Students must bring their textbook and lecture notes. <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> Students desiring to discuss career plans, can request to schedule an appointment at other times. Office Hours are suspended the day of the Exam (no questions will be answered).
Text (Required): 7 th Edition or 8 th Edition	<u>Textbook (required)</u> <i>Biochemistry, 8th Ed.</i> , 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> <u>Workbook (strongly recommended)</u> : Includes learning objectives, self-assessment problems with solutions, and expanded solutions to end-of-chapter textbook problems: <i>Biochemistry Student Companion, 8th Ed.</i> , 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. <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>
Learning Outcomes:	Course will focus on <i>developing an in-depth understanding of biochemical principles and processes that govern the structure, interactions, functions & transformations of biomolecules.</i> Upon successful completion of the course students will have the tools to be able to apply their knowledge of biochemistry to <i>understand the causes of human diseases</i> , as well as <i>applications of biochemistry in medicine and the environment.</i>

<p>Grading for Undergraduate Students:</p> <p>Chem 4610 Biol 4930</p>	<p><u>Undergraduates:</u> 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).</p> <p>Semester Grade = [(sum 3 best class exams + final exam) / 450] * 100</p>
<p>Grading for Graduate Students:</p> <p>Chem 6610</p>	<p><u>Graduates:</u> 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).</p> <p>Semester Grade = [(sum 3 best class exams + final exam + written work)/500] * 100</p> <p>Note: B or higher needed by Graduates students for course to count towards degree.</p>
<p>Grading Scale:</p>	<p>A+ 97% A 90% A- 87% B+ 84% B 80% B- 77% C+ 74% C 70% C- 67% D 60% F <60%</p>
<p>Course Policies:</p>	<ol style="list-style-type: none"> 1) <u>NO MAKE-UP or RESCHEDULING OF EXAMS (before or after exam date & time) will be carried out under ANY CIRCUMSTANCE.</u> <u>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 4th.</u> 2) ACS Biochemistry Exam (Biochemistry I & II topics, worth 100pts) will be given as a practice final exam on April 27th and is mandatory for all students. This grade can replace an in-class exam grade if it improves the student's overall grade. It cannot replace a missed exam grade. 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. Late students will not be allowed to start an exam 30mins beyond the start time. 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. 5) Class PowerPoint notes for ALL sections will be posted on one iCollege page: BIOCHEMISTRY II XLS GROUP SR SPRING SEMESTER 2020 Some class notes will only be given on the board during class. <u>Changes in schedule/topics will be announced in iCollege, so check this regularly.</u> 6) <u>Students are responsible for checking their exam scores posted on iCollege.</u> Any discrepancies need to be addressed within 1 week after grades have been posted on iCollege. Changes will not be made at the end of the semester. 7) Tuesday Mar 3rd 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. <p>The University requires that faculty members must, on a date after the official semester mid-point:</p> <ol style="list-style-type: none"> 1. Give a WF to all those students who are on their rolls but no longer taking the class. 2. Report the last day the student attended or turned in an assignment.

<p>Suggestions for how to do well in Biochemistry:</p>	<p><u>Biochemistry cannot be learned overnight, do NOT wait till the end to study</u></p> <ol style="list-style-type: none"> 1) Students are strongly encouraged to carefully PREVIEW (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 of class. 2) <u>Attendance at all classes is crucial to the student's success in this course.</u> Students are encouraged to download the lecture notes from iCollege before class. Answers to blanks in PPT notes will ONLY be available during class. Some notes will be given only on the board. <u>Class roll will be taken on some days.</u> 3) Announcements will be posted on iCollege, so please check on a daily basis, and between class meetings. 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. During class the focus will be on in-depth discussion of the more complex topics and on solving biochemical problems. Students are responsible for all notes provided on the board during class. 5) Biochemistry II is an advanced course, so students are expected to know and be able to use all topics covered in Biochemistry I, even if not discussed specifically in Biochemistry II. All students must take the ACS Biochemistry exam, which covers material from the entire textbook (Chapters 1 – 30). 6) 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), enzyme regulation (sections 10.2, 10.3), bioenergetics (chapter 15), and glucose catabolism (sections 16.1, 17.2, chapter 18). 7) Prior to Unit 2 (carbohydrate metabolism) and Unit 3 (lipid metabolism), students are strongly encouraged to review <u>Glycolysis, Citric Acid Cycle, Bioenergetics, and Enzyme Regulation at home</u>, since these two pathways and energy considerations play a central role throughout metabolism. In particular review text sections 16.1 and 17.2, 10.3 and chapter 15. 8) Chapter outlines will be posted specifying topics covered from textbook. Specific problems will be assigned for each chapter from the <u>workbook self-test questions and problems</u>, and the <u>textbook end-of-chapter problems</u>. 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> The best way to prepare for exams is to test your knowledge by regularly working problems throughout the semester. Don't wait till the end of the chapter to work problems. <u>The exam is not a good place to do problems for the first time!</u> 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. <u>Material from each class is often used in next class,</u> <u>so STUDY Biochemistry DAILY!</u>
<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><u>A student who cheats on an exam will receive a zero for that exam, which cannot be dropped as the lowest grade.</u> 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>

BIOCHEMISTRY II: Chem 4610 / Chem 6610 / Biol 4930 TENTATIVE SCHEDULE

Date	Day	Chapter	<i>Signal Transduction, Immunology, Studying Proteins</i>	No.
Jan 13	M	3	Introduction to Course, Exploring Proteins (review Protein Structure - Chapter 2 at home)	1
Jan 15	W	14	Signal Transduction: G-protein Coupled Receptors (GPCR), Adenylate Cyclase	2
Jan 20	M	(12)	Martin Luther King Holiday, no class (review Chapter 12 at home)	
Jan 22	W	14	Receptor Tyrosine Kinase & Insulin, Epidermal Growth Factor	3
Jan 27	M	13, 14	Ion Transport through Membranes, Ion Channel Linked Receptors	4
Jan 29	W	34	Immunology: Antibodies, T-cell Receptors, MHC	5
Feb 3	M		Exam 1 – Material from Chapters 3, 13, 14, 34, (2, 12)	6
			<i>Carbohydrate Metabolism and Regulation</i>	
Feb 5	W	16 (11,15)	Gluconeogenesis, Bioenergetics and Glycolysis Review (review text Chapters 11,15,16.1,10.3; & PPTs 10.1, 11.1,15.1,16.1 at home)	7
Feb 10	M	10, 16	Enzyme Regulation and Glycolysis Regulation	8
Feb 12	W	21	Glycogen Metabolism (review PPT 11.2 at home)	9
Feb 17	M	21	Allosteric & Hormonal Regulation of Glucose Metabolism	10
Feb 19	W	20	Pentose Phosphate Pathway & Coordination with Glycolysis	11
Feb 24	M	16, 20	Galactose/Fructose Metabolism and Reactive Oxygen Species	12
Feb 26	W		Exam 2 – Material from Chapters 10, 16, 20, 21, (11, 15)	13
			<i>Lipid Metabolism and Regulation</i>	
Mar 2	M	17	Pyruvate Dehydrogenase Complex Mechanism (review Citric Acid Cycle text section 17.2 and PPT 17.1 at home)	14
Mar 3	Tues		Last day to Withdraw and possibly receive a W	
Mar 4	W	17, 22	Citric Acid Cycle Energetics, Regulation and Ketone Bodies	15
Mar 9	M	22	Fatty Acid Catabolism and Biosynthesis	16
Mar 11	W	26	Cholesterol Biosynthesis and Transport	17
Mar 16–20	M-F		Spring Break, no class (review fatty acid & cholesterol metabolism)	
Mar 23	M	22, 26	Coordinated Regulation of Lipid Metabolism	18
Mar 25	W	27	Diabetes Mellitus – Integration of Carbohydrate & Lipid Metabolism	19
Mar 30	M		Exam 3 – Material from Chapters 17, 22, 26, 27, (12, 18)	20
			<i>Nitrogen Metabolism: Amino Acids, Nucleotides, DNA</i>	
Apr 1	W	23	Protein Turnover, Nitrogen Transport and Urea Cycle	21
Apr 6	M	23	Amino Acid Catabolism, Regulation, and Fates of Carbon Skeletons	22
Apr 8	W	24	Amino Acid Biosynthesis and Carbon Donors: SAM, THF	23
Apr 13	M	25, 10.1	Nucleotide Biosynthesis: Ribonucleotides, Deoxyribonucleotides	24
Apr 15	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 20	M	5, 9	Cloning – Recombinant DNA Technology Restriction Enzymes and Gene Expression	26
Apr 22	W		Exam 4 – Material from Chapters 23, 24, 25, 28, 5, (4)	27
Apr 27	M		Biochemistry ACS Exam – Practice Final Exam (required)	28
Apr29,May1	W, F		Optional Final Exam Reviews	
May 4	Mon	1:30 – 4:00 pm	Biochemistry II – Comprehensive Final Exam (Chapters 1 – 18, 20 – 28, 34) <u>Time: 1:30 pm – 4:00 pm</u>	