

BIOCHEMISTRY II

CHEM 4610 (CRN 13622), CHEM 6610 (CRN 13623), BIOL 4930 (18942)

Spring 2021 Online

Prerequisites:	Chem 1212K, 3410, 4600 (grade C or better in Organic II and Biochemistry I)
Instructor:	Dr. Gigi B. Ray, gbray@gsu.edu (use gsu email & put 'Biochemistry II' in subject line)
Class Meeting Fully Online (synchronous):	<u>MW 3:30 pm – 4:45 pm via iCollege WebEx at:</u> (3-credit hour course) <u>BIOCHEMISTRY II XLS Group SR Spring Semester 2021</u> <u>Students are expected to be present & participate online during regular classtime</u> <u>Before class READ text material for the day & VIEW relevant videos in iCollege</u>
Optional Review Sessions Biochemistry II Group Office Hours	<u>Mondays & Wednesdays 4:45 – 5:30 pm via iCollege WebEx</u> The instructor will be available twice a week all semester for group discussion sessions to answer questions on current material. <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 Online:	By appointment via WebEx in iCollege or email to gbray@gsu.edu <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): 8 th or 9 th Edition - Reading assignments will be given for the 8 th Ed textbook - Questions from 8 th Ed textbook and workbook will be assigned and discussed during class	<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 978-1-4641-2610-9 Hardcover or ISBN 1-4641-8801-7 Looseleaf] <i>Biochemistry, 9th Ed.,</i> Berg, J.M.; Tymoczko, J.L.; Gatto, G.J.; Stryer, L., (2019), W.H. Freeman: New York, NY. [ISBN 978-1-3191-1467-1 Hardcover or ISBN 978-1-3191-1480-0 Looseleaf, or ISBN 9781319234362 E-book] <u>Workbook (strongly recommended):</u> Includes learning objectives, self-assessment problems & comprehensive problems with solutions. Also contains 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. [Paperback]
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. 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. <u>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).</u>

Learning Outcomes:	<p>Upon successful completion of the course students will be able to:</p> <ul style="list-style-type: none"> - Demonstrate an understanding of basic chemical principles, such as intermolecular interactions, organic mechanisms, & thermodynamics, and how they facilitate biochemical processes. - Demonstrate an understanding of fundamental biochemical principles, such as the interplay between structure and function of biomolecules, catabolic and biosynthetic metabolic pathways, and regulation of biochemical processes at the cellular & organ level - Apply biochemical principles and information to solve problems and explain biochemical transformations. - Interpret and derive information from graphical analysis and data sets. - Critically analyze the biochemical literature and explain topics related to, but not directly discussed in class. - Draw from their knowledge of biochemistry to understand the causes of human diseases, as well as applications of biochemistry in medicine, agriculture and the environment.
Exam Format:	<p>The course will require students to use iCollege LockDown Browser with Respondus Web Monitor to take all course Quizzes, Exams and the Final Exam. Students will need a webcam-enabled device capable of installing Lockdown Browser such as a computer or tablet (not a phone). Students who require a device may request one at: https://cetl.gsu.edu/resources/resources-for-learning-remotely/internet-options/</p> <p>Students are <u>required to show their student identification</u> picture I.D. (GSU ID or driver's license) in order to start exams using Lockdown Browser and Respondus Monitor. The exam will close for all students at the scheduled end time.</p> <p><u>Exams 1 – 4 and the Final Exam will have two components:</u></p> <p>(i) online exam in multiple choice, true/false and matching formats and</p> <p>(ii) short answer component that will only be released at the end of the online exam (involving drawing pathways, mechanisms, explanatory essays). The short answer section will need to be completed and uploaded to iCollege within a designated time frame following the online exam (usually one hour). Answers must be neat & legible and represent the student's own work without outside assistance (human or electronic).</p> <p>Students will need to use Adobe Scan to create a PDF of their short answer section (pictures in .jpg, .gif, .png will not be accepted, only clearly readable PDF files accepted).</p> <p>Students need to do an exam technology check in advance. All exams are closed book so textbooks, workbooks, notes (written or electronic), other websites and other devices (including phones) are not allowed to be open or on during exams. Exams need to be taken alone without the presence or assistance of other individuals.</p>
Grading Scale:	<p>A+ 97% A 93% A- 89% B+ 85% B 80% B- 75% C+ 70% C 64% C- 58% D 50% F <50%</p>
<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 cumulative final exam is mandatory and will not be dropped under any circumstance.</p> <p>Homework assignments (written ones submitted via iCollege & online using Achieve), and class participation are collectively worth 100 points.</p> <p>The class exam with the lowest grade will be dropped (<i>not exam 4</i>) before totaling the remaining possible points out of 550 (this is 100% for Undergraduate students).</p> <p>Semester Grade = [(sum 3 best class exams + final exam + homework) / 550] * 100</p>

<p>Grading for Graduate Students: CHEM 6610</p>	<p>Graduates: There will be four class exams worth 100 points each and a comprehensive final exam worth 150 points. The cumulative final exam is mandatory and will not be dropped under any circumstance.</p> <p>Homework assignments (written ones submitted via iCollege & online using Achieve), and class participation are collectively worth 100 points.</p> <p><i>Graduate students will have additional take-home writing assignments worth 50 points.</i></p> <p>The class exam with the lowest grade will be dropped (<i>not exam 4</i>) before totaling the remaining possible points out of 600 (this is 100% for Graduate students).</p> <p>Semester Grade = $\left[\frac{\text{sum 3 best class exams} + \text{final exam} + \text{homework} + \text{written work}}{600} \right] * 100$</p> <p>Note: B or higher needed by Graduates students for course to count towards degree.</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 and time) will be carried out under ANY CIRCUMSTANCE. If you miss a class exam for ANY REASON, that is your dropped grade. The final exam MUST be taken 1:30 – 4:00pm on Monday May 3rd.</u> 2) Exams will be administered online via iCollege on scheduled days between 9:00am – 9:00pm. Students are required to use Respondus Lockdown Browser & Respondus Monitor while taking exams. Exams need to be taken on a computer or tablet, and not on a phone. A webcam is required to take exams. 3) <i>Students are responsible for knowing all material in assigned sections of the textbook, posted course videos and PPT notes, even if topics are not discussed in class.</i> During class meetings the focus will be on in-depth discussion of the more complex topics and on solving biochemical problems. 4) Students are required to participate in synchronous class meetings, with participation and viewing of course videos in iCollege monitored for participation credit. 5) Cell phones, calculators, tablets, laptops, computers, and ALL other electronic devices besides the computer being used to take the exam are NOT allowed out on desks during exams. Phones must be <u>OFF</u>. During an exam if phones ring, conversations are heard, or viewing of other sources are observed, points will be deducted. 6) Class notes in iCollege: BIOCHEMISTRY II XLS GROUP SR SPRING SEMESTER 2021 <u>Changes in schedule or exams will be announced in iCollege, so check daily.</u> 7) <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> Changes will not be made at the end of the semester. 8) Online homework will be assigned using the Achieve platform embedded in iCollege. 9) Tuesday Mar 2nd 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>Academic Honesty:</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, phones, any electronic device other than computer on which the exam is being taken, and assistance from others 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>

<p>Online Academic Honesty:</p>	<p><u>All course materials posted online in iCollege can only be used for this course.</u></p> <p>All content created in this course, including online videos, PowerPoints, exams and homework assignments may be used only by students enrolled in the course for purposes relating to the course. No electronic materials may be posted in any external forum such as Chegg, Course Hero, Quizlets. Downloading, copying, photographing and sharing any course material with individuals not in the course is considered cheating.</p> <p>Failure to abide by these limitations constitutes a violation of the Policy on Academic Honesty and will be treated accordingly.</p>
<p>Suggestions for how to do well in Biochemistry II:</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, lecture notes and course videos BEFORE class, and REVIEW relevant material from Biochemistry I in advance of class. 2) <u>Viewing of all posted materials and participation in group discussions are crucial to the student's success in this course.</u> Students are encouraged to download lecture notes and view explanatory videos with from iCollege before class. 3) Biochemistry II is an advanced course, so students are expected to know and be able to use all topics covered in Biochemistry I. 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, 18). 4) Chapter outlines will be posted specifying topics covered from the textbook. <u>Specific problems will be assigned for each chapter</u> from the <u>workbook self-test questions and problems</u>, and the <u>textbook end-of-chapter problems</u>. Try problems in this sequence and don't wait till the end of the chapter to start problems. <i>Solutions with explanations to all problems (including those in textbook) are available in the workbook.</i> <p>The best way to prepare for exams is to test your knowledge by regularly working problems throughout the semester. Don't wait till the last day to start preparing.</p> <p><u>The exam is not a good place to do problems for the first time!</u></p> <ol style="list-style-type: none"> 9) Students are strongly encouraged to keep up with the material, read the text, review the instructor's notes & videos, make their own notes, do homework problems daily, after class and prior to the next class, as well as attend reviews often and ask questions. <p><u>Material from each class is often used in next class, so STUDY Biochemistry DAILY!</u></p>

BIOCHEMISTRY II: Chem 6610 / 4610 / Biol 4930 TENTATIVE ONLINE SCHEDULE for Spring 2021

Date	Day	Chapter	<u>Signal Transduction, Enzyme Regulation, Immunology</u> (review text Chapter 2 -Protein Structure & Chapter 12 -Membranes at home)	No.
Jan 11	M	3	Introduction to Course, Exploring Proteins	1
Jan 13	W	14	Signal Transduction: G-protein Coupled Receptors, Adenylate Cyclase	2
Jan 18	M	(12)	<u>Martin Luther King Holiday, no class</u> (review Chapters 12 & 13 at home)	
Jan 20	W	14	Receptor Tyrosine Kinase & Insulin, Epidermal Growth Factor → Friday Jan 22 - Homework 1: Insulin	3
Jan 25	M	13,14	Ion Transport through Membranes, Ion Channel Linked Receptors	4
Jan 27	W	34	Immunology: Antibodies, T-cell Receptors, MHC → Friday Jan 29 - Homework 2: Glycolysis	5
Feb 1	M	10, 15	Enzyme Regulation, and Energy Charge Review (review text Chapters 15, 16.1 and PPTs 9.1, 11.1, 15.1, 16.1 at home)	6
Feb 3	W	16	Glycolysis Regulation and Exam 1 Review	7
Feb 5	F		Exam 1– Material from Chapters 3, 10, 13, 14, 34, (2, 12)	

Date	Day	Chapter	Carbohydrate Metabolism and Regulation (review text Chapters 11,15,16.1 & PPTs 11.1,15.1,16.1, 9.1 at home)	No.
Feb 8	M	16, 15	Gluconeogenesis, Coordinated Regulation & Bioenergetics	8
Feb 10	W	21	Glycogen Metabolism (review text Chapter 11.2, PPT 11.2 at home) → Friday Feb 12 – Graduate Assignment 1: Metabolism Case Study	9
Feb 15	M	21	Allosteric & Hormonal Regulation of Glucose Metabolism	10
Feb 17	W	20	Pentose Phosphate Pathway & Coordination with Glycolysis → Friday Feb 19 - Homework 3: Citric Acid Cycle	11
Feb 22	M	16, 20	Galactose/Fructose Metabolism, Glutathione, ROS	12
Feb 24	W	17	Citric Acid Cycle (TCA) Decarboxylations and Exam 2 Review	13
Feb 26	F		Exam 2 – Material from Chapters 16, 20, 21, (11, 15)	
			Lipid Metabolism and Regulation (review Citric Acid Cycle text section 17.2 and PPTs 17.1, 18.1 at home)	
Mar 1	M	17	Pyruvate Dehydrogenase Complex Mechanism & TCA in Biosynthesis → Monday Mar 1 – Literature Article Title on Citric Acid Cycle (TCA) Enzyme	14
Mar 2	Tues		Last day to Withdraw and possibly receive a W	
Mar 3	W	22	Fatty Acid Catabolism (β -Oxidation) and Energy Output	15
Mar 8	M	22	Fatty Acid Biosynthesis, Ketone Bodies & Pathway Integration	16
Mar 10	W	26	Cholesterol Biosynthesis and Transport → Friday Mar 12 – Graduate Assignment 2: Metabolism Case Study	17
Mar 15–19	M-F		Spring Break, no class (review fatty acid & cholesterol metabolism)	
Mar 22	M	17, 22	Coordinated Regulation of Lipid Metabolism (TCA, PDHC, Fatty Acids) → Monday Mar 22 – Homework 4: Literature Article Critique	18
Mar 24	W	26	Cholesterol Regulation & Transport and Exam 3 Review	19
Mar 26	F		Exam 3 – Material from Chapters 17, 22, 26, (12, 18)	
			Nitrogen Metabolism: Amino Acids, Nucleotides, DNA (review DNA Structure & Replication – text Chapters 4, 28.1 at home)	
Mar 29	M	23	Protein Catabolism and Urea Cycle	20
Mar 31	W	23	Amino Acid Catabolism, Fates of Carbon Skeletons, and Nitrogen Transport to Liver	21
Apr 5	M	24, 25	Amino Acid Biosynthesis: Carbon Donors (SAM & THF) Introduction to Nucleotides (Salvage Pathways)	22
Apr 7	W	25	Nucleotide Biosynthesis: Ribonucleotides → Friday Apr 9 – Homework 5 on ATCase Regulation	23
Apr 12	M	25,10.1	Nucleotide Biosynthesis: Deoxyribonucleotides & Regulation	24
Apr 14	W	4, 28.1	DNA Replication Review and Exam 4 Review	25
Apr 16	F		Exam 4 – Material from Chapters 23, 24, 25, (4)	
			Integration of Metabolism	
Apr 19	M	27	Integration of Metabolism – Diabetes Mellitus	26
Apr 21	W	27, 5	Integration of Metabolism and Biotechnology: DNA Sequencing, PCR, Reverse Transcriptase	27
Apr 26	M	5	Cloning - Recombinant DNA Technology (cDNA) Gene Expression of Eukaryotic Proteins Using Bacteria (Insulin) Final Exam Review	28
Apr 28 & 30	W, F		Optional Final Exam Reviews	
May 3	Mon	1:30 – 4:00 pm	Biochemistry II – Comprehensive Final Exam (Chapters 1 – 18, 20 – 28, 34) Time: 1:30 pm – 4:00 pm	