

BIOCHEMISTRY I

Chem 4600 (CRN 84156) / HON Chem 4600 (CRN 85247)

Fall 2018

Prerequisites:	<i>Required: Chem 1212K, 2400 and 2410 (grade of C or higher in Organic II)</i> <i>Recommended: Biol 3800 (Molecular Cell Biology), Chem 3400 (Biomolecules)</i>
Instructor:	Dr. Gigi B. Ray, 212 Courtland North, Tel. (404) 413-5540, gbray@gsu.edu
Lecture:	MWF 8:20 am – 9:50 am, Urban Life Building, Room 100 (5-credit hour course) <u>Students are expected to come to class having PREVIEWED topics for that day.</u> <u>iClicker Quizzes in class. Online Quizzes on weekends via iCollege.</u>
iCollege:	PowerPoint notes posted on iCollege as Cross Listed Section (print and bring to class): BIOCHEMISTRY I XLS GROUP VW FALL SEMESTER 2018
Optional Weekly Review Sessions Strongly Recommended	<u>Reviews: Mondays 10–11am (STEM 110E) & Wednesdays 1:30–2:30pm (PSC 362)</u> The instructor will be available every week all semester for review 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. <u>Tutoring Center</u> in Sports Arena 110 (STEM Center) – student tutor available specifically for Biochemistry courses in Chemistry Tutoring Center. Time TBA.
Office Hours:	Mondays 12:30 – 2:30 pm and Wednesdays 3:00 – 5:00 pm in 212 Courtland North Instructor will be available to meet with students individually during office hours. <i>Students must bring their textbook, lecture notes, and attempted homework.</i> Office Hours are suspended on exam days. No questions will be answered on exam days. <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 course advising or career plans, can request to schedule an appointment outside of office hours.
Text (Required): <i>You can use either the 7th or 8th Edition*</i> <i>*note questions numbers on assigned homework may be different</i>	<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 1-4641-2610-0 <i>Hardcover</i> or ISBN 1-4641-8801-7 <i>Looseleaf</i>] <i>or Biochemistry, 7th Ed.</i> , Berg, J.M.; Tymoczko, J.L.; Stryer, L., (2012), W.H. Freeman: New York, NY. [ISBN 1-4292-2936-5 <i>Hardcover</i> or ISBN 1-4292-7396-8 <i>Looseleaf</i>] <u>iClicker 2 (required):</u> will be used for in-class questions every day. <u>Workbook (strongly recommended):</u> <i>Biochemistry Student Companion, 8th Ed.</i> , Fertuck, K.; Rhodes, C.; Josephy, D.; Koeppel, R.E., (2015), W.H. Freeman: New York, NY. [ISBN 1-4641-8803-3 <i>Paperback</i>]. <i>Includes learning objectives, self-assessment problems with solutions, and expanded solutions to end-of-chapter textbook problems.</i>
Learning Outcomes:	The course will focus on <i>developing an understanding of the biochemical principles and processes that govern the structure, interactions, functions & transformations of biomolecules</i> ; this will help students rationalize biochemical facts and solve problems. Upon successful completion of the course students will have the tools to be able to apply their knowledge of biochemistry to understand the causes of human diseases, as well as applications of biochemistry in medicine, agriculture and the environment.

Course Objectives:	<p>A comprehensive and integrated review of modern biochemistry with emphasis on proteins, enzymes, nucleic acids, lipids, carbohydrates and metabolism.</p> <p>Will examine biomolecular structure-function relationships, concepts of enzyme function, regulation, bioenergetics, metabolism, gene expression, and characterization of biomolecules. Organization, transport and signaling in cells will also be examined.</p> <p><u>Principles of ORGANIC MECHANISMS, KINETICS and THERMODYNAMICS will be applied throughout (working knowledge is expected PRIOR to taking biochemistry).</u></p>
Grading for Undergraduate Students:	<ul style="list-style-type: none"> • There will be four class exams worth 100 points each. The lowest grade among class exams 1,2 & 3 will be dropped. Note exam 4 will not be dropped. • There will be a comprehensive final exam worth 150 points (on Dec 5th at 8:00am). The final exam is mandatory and it will not be dropped under any circumstance. • Quizzes (iClicker in class and via iCollege at home) will collectively be worth 50 points. There will be 10 online quizzes and the lowest two scores will be dropped. <i>[Quiz Points = (sum all iClicker points and best 8 online quiz scores), divided by 2]</i> <p>Semester Grade = [(sum 3 best class exams + quiz points + final exam) / 500] * 100</p> <ul style="list-style-type: none"> • Total possible points is 500. No makeup exams or quizzes..
Grading Scale:	<p>A+ 97% A 90% A- 87% B+ 84% B 80% B- 76% C+ 71% C 65%</p> <p>C- 59% D 50% F <50%</p>
Exams:	<p style="text-align: center;"><u>COURSE POLICIES</u></p> <p><u>1) NO MAKE-UP or RESCHEDULING OF EXAMS (before or after exam date and time) will be carried out under ANY CIRCUMSTANCE.</u></p> <p><u>If you miss a class exam for ANY reason, that is your dropped grade.</u></p> <p><u>The Final Exam must be taken Wed Dec 5th at 8:00 – 10:30 am.</u></p> <p>2) <u>Exams and quizzes may cover material assigned in textbook or in PowerPoint notes, but not necessarily covered in class.</u> Students are responsible for knowing all assigned reading material and homework problems. PowePoint notes in iCollege.</p> <p>3) The Instructor reserves the right to seat or move students during exams for any reason.</p> <p>4) <u>Students are required to show (and leave) their student identification on the desk in order to take and submit an exam. Exams will be collected and graded ONLY if a student picture I.D. is shown (GSU ID card or driver's license).</u></p> <p>5) <u>Cell phones, calculators, ipods, iphones, tablets, laptops and all other electronic devices are NOT allowed out on classroom tables during exams.</u> Cell phones and anything with an on/off switch must be <u>OFF</u> during all exams and silent during class. If a phone rings during an exam, the instructor may answer it and points deduct points.</p> <p>6) <u>Students are responsible for checking their exam scores posted on iCollege. Scantrons & Exams can be viewed during scheduled times in instructor's office.</u> Any discrepancies need to be addressed within 1 week after grades have been posted. Changes will not be made at the end of the semester.</p> <p>7) <u>Tuesday Oct 9th is the last day to withdraw from the class and receive a "W".</u> You are responsible for withdrawing before the deadline if you need to do so. <u>If more than one exam is missed for legitimate reasons</u>, you should seek a hardship withdrawal from the Dean of Students. If you do not withdraw and miss the final exam, or miss more than one class exam, then zeros will be assigned for these grades. Poor performance will not be rewarded with incompletes. 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"> 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> <p><i>To succeed in biochemistry one must learn to speak the language of biochemistry:</i></p> <p>PREVIEW the day's topic before class so you are prepared for iClicker questions in class. PARTICIPATE in class by asking questions. After class, REINFORCE by READING the textbook carefully, and REVIEWING and/or recopying class notes before next class. APPLY concepts by regularly doing assigned HOMEWORK PROBLEMS from textbook and workbook. It will be difficult to answer questions on exams if problems have not been practiced at home. Passing the course requires more than simply memorizing the material, one needs to be able to apply the material. ASK questions during weekly REVIEWS.</p> <p><u>Material from each class is often used in next class, STUDY biochemistry DAILY!</u></p> <ul style="list-style-type: none"> - Download the lecture notes from the iCollege website before coming to class. - <u>Attendance at all classes is crucial to the student's success in this course.</u> - Board notes and answers to blanks in PowerPoint notes will ONLY be available during class. <p><u>The exam is not a good place to do problems for the first time!</u></p> <p>Chapter outlines will be posted listing specific problems for each chapter from the workbook self-test questions & problems, and the textbook end-of-chapter problems. Try problems in this sequence as topics are covered. Solutions to all problems (including those in textbook) are available in the workbook. Practice exams will be posted before each class exam.</p> <p>Weekly quizzes will be (1) assigned in iCollege - quizzes will open at 5pm on Friday and close at 8am the following Monday, (2) iClicker quiz questions daily in class (no makeups if missed).</p> <p>Announcements will be posted on iCollege, so please check on a daily basis.</p>
<p>Cheating:</p>	<p>All tests and quizzes taken must represent your individual, unaided effort. To receive or offer information during an examination is cheating. The use of unauthorized supplementary materials or any electronic or photographic 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>

TENTATIVE CLASS SCHEDULE (Subject to change) * indicates after class REVIEW Q = start of quiz

Date	Day	Chapter	<i>Amino Acids, Proteins and Hemoglobin Function</i>	Lecture No.
Aug 20	M*	1	Introduction to Course Review: Intermolecular Interactions and Acid-Base Chemistry (pK _a)	1
Aug 22	W*	1	Aqueous Biochemistry (Buffers) and Amino Acids	2
Aug 24 Q1	F	2	Amino Acid Structures, Properties (pI, net charge) and Reactivity	3
Aug 27	M*	2	Peptide Bonds and Secondary Structure	4
Aug 29	W*	2	3D Protein Structure (3° & 4°) & Protein Folding	5
Aug 31 Q2	F	7	Hemoglobin Structure & Oxygen Transport	6
Sept 3	M		Labor Day Holiday, no class	
Sept 5	W*	7	Hemoglobin Cooperativity	7
Sept 7 Q3	F	7	Hemoglobin Allostery: Fine Tuning O ₂ Binding Affinity	8
Sept 10	M*	3	Protein Purification Techniques	9
Sept 12	W*	3	Protein Structure Analysis, Sequencing and Immunology	10
Sept 14	Fri		Exam 1 (Material from Chapters 1, 2, 3, 7)	11

TENTATIVE CLASS SCHEDULE (Subject to change) * indicates after class REVIEW Q = start of quiz

Date	Day	Chapter	<i>Enzymes: Kinetics, Catalytic Mechanisms and Regulation</i>	Lecture
Sept 17	M*	8	Introduction to Enzymes	12
Sept 19	W*	8	Enzymes: Michaelis-Menten Kinetics	13
Sept 21 Q4	F	8	Enzymes: Inhibition	14
Sept 24	M*	9	Catalytic Strategies and Serine Proteases	15
Sept 26	W*	9	Chymotrypsin Mechanism and Specificity	16
Sept 28 Q5	F	10	Enzymes: Regulation	17
Oct 1	M*	10, 9	Chymotrypsin Regulation & Carbonic Anhydrase Mechanism	18
Oct 3	W*	11	Carbohydrates: Structure and Reactivity	19
Oct 5	Fri		Exam 2 (Material from Chapters 8, 9, 10)	20
			<i>Carbohydrate Metabolism: Glycolysis and Glycogen</i>	
Oct 8	M*	11, 15	Polysaccharides and Energy Changes in Metabolism	21
Oct 9	T		Last day to Withdraw and possibly receive a W	
Oct 10	W*	15	Bioenergetics	22
Oct 12 Q6	F	15, 16	Reactions of Metabolism and Glycolysis	23
Oct 15	M*	16	Glycolysis Reactions I, and Enzyme Mechanisms	24
Oct 17	W*	16	Glycolysis Reactions II, and Enzyme Mechanisms	25
Oct 19 Q7	F	16	Glycolysis Regulation and Gluconeogenesis	26
Oct 22	M*	21, 11	Introduction to Glycogen Metabolism	27
Oct 24	W*	12, 13	Lipids & Membrane Structure and Transport Across Membranes	28
Oct 26	Fri		Exam 3 (Material from Chapters 11, 15, 16, 21)	29
			<i>Energy Metabolism: Citric Acid Cycle, ATP and Fatty Acids</i>	
Oct 29	M*	17	Fates of Pyruvate: Aerobic (PDHC), Anaerobic (Lactate DH)	30
Oct 31	W*	17	Citric Acid Cycle (TCA) Reactions I, and Enzyme Mechanisms	31
Nov 2 Q8	F	17	Citric Acid Cycle (TCA) Reactions II, and Enzyme Mechanisms	32
Nov 5	M*	18	Electron Transport Chain & Biochemical Oxidation-Reduction	33
Nov 7	W*	18	Mitochondrial Electron Transport Chain: Q-cycle & Proton Pumping	34
Nov 9 Q9	F	18	Oxidative Phosphorylation & Energy Output	35
Nov 12	M*	22	Introduction to Fatty Acid Catabolism: Beta Oxidation	36
Nov 14	W*	4	DNA Structure and Function Review	37
Nov 16	Fri		Exam 4 (Material from Chapters 12, 13, 17, 18, 22)	38
Nov 19-23	M – F		Thanksgiving Break, no class	
			<i>DNA Replication and Gene Expression</i>	
Nov 26	M*	4, 28	DNA Replication and Gene Expression in Prokaryotes	39
Nov 28	W*	14	Diabetes, GLUT Transporters, and Regulation by Insulin (RTK)	40
Nov 30 Q10	F	14, 27	Diabetes and Hormonal Regulation by Glucagon (GPCR)	41
Dec 3	M*		Final Exam Review	42
Dec 4	**T		Optional Final Exam Review (time & location TBA)	**optional
Dec 5	Wed		Cumulative Final Exam – All Chapters Covered Time: 8:00 am - 10:30 am (includes Chapters 4, 28, 14)	