BIOCHEMISTRY I

Chem 4600 (CRN 86541)

Fall 2014

Prerequisites:	Chem ***1212K,*** 2400, ***3410 (grade of C or better in Organic II)***
Instructor:	**Dr. Gigi B. Ray, 212 Courtland North, Tel. (404) 413-5540, gbray@gsu.edu**
Lecture:	**MWF 8:30 – 10:00 am, Room 5, Aderhold Learning Center (5-credit hour course)** ***Students are expected to come to class having READ the material for that day.***
Desire2Learn:	Class notes posted on Desire2Learn as Cross Listed Section: **HON BIOCHEMISTRY I XLS Group VW Fall Semester 2014 CO** • ***Same D2L page will be used for regular and honors sections of course***
Optional Weekly Tutorial Sessions Strongly Recommended	**Optional Review Session on Mondays 10 – 11 am, in Natural Science Center 218** The instructor will be available once a week all semester for review sessions to answer questions on current material. ***This is the best time to ask questions on specific homework problems and lecture topics.*** Regularly work problems at home, come frequently with questions, and improve your understanding and skills in solving biochemistry problems.
Office Hours:	**Mondays 1:00pm – 3:00pm and Wednesdays 10:30am – 12:30pm** Instructor will be available to meet with students individually during office hours. Students must bring their textbook and lecture notes. ***Students who wish to discuss exam absences or other individual concerns need to schedule an appointment outside of class time during office hours.*** **Office Hours are suspended the day of the Exam**. No questions will be answered on the day before and the day of exams. Students desiring to discuss course advising, career plans, etc., can request to schedule an appointment outside of office hours.
Text (Required): *Homework will be assigned for 7th Edition* *(Question numbers are different in 6th Ed)*	***Textbook (required):*** ***Biochemistry, 7th Ed.,*** Berg, J.M.; Tymoczko, J.L.; Stryer, L., (**2012**), W.H. Freeman: New York, NY. [ISBN 1-4292-2936-5 *Hardcover* or ISBN 1-4292-7396-8 *Looseleaf*] ***Workbook (strongly recommended):*** Includes learning objectives, self-assessment problems with solutions, and expanded solutions to end-of-chapter textbook problems: ***Biochemistry Student Companion, 7th Ed.***, Deis, F.H.; Gerber, N.C.; Gumport, R.I.; Koeppe, R.E., (**2012**), W.H. Freeman: New York, NY. [ISBN 1-4292-3115-7 *Paperback*]
Learning Outcomes:	The course will focus on ***developing an understanding of the biochemical principles and processes that govern the structure, interactions, functions & transformations of biomolecules***.This will help students rationalize biochemical facts and solve problems. Students will learn core biochemical concepts and how to apply these to understanding, analyzing and solving complex biochemical 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:	A comprehensive and integrated review of modern biochemistry with emphasis on proteins, enzymes, nucleic acids, lipids, carbohydrates and metabolism. Course will examine **biomolecular structure-function relationships**, concepts of enzyme function, regulation, bioenergetics, metabolism, gene expression, and study of biomolecules. Organization, transport and signaling in cells will also be examined. ***Principles of ORGANIC MECHANISMS, KINETICS and THERMODYNAMICS will be applied throughout (working knowledge is expected PRIOR to taking biochemistry).***
Grading:	**There will be four class exams worth 40 points each** and a **comprehensive final exam worth 60 points**. **The final exam is mandatory** and it will not be dropped under any circumstance. **Quizzes will collectively be worth 20 points.** The lowest 2 quiz grades will be dropped. Each quiz has 10 questions. [**Quiz Points** = (sum of best 8 quiz scores) divided by 4] The class exam with the lowest grade will be dropped before totaling the remaining **possible points out of 200**. **Semester Grade = [(sum 3 best class exams + quiz points + final exam) / 200] * 100**
Grading Scale:	**A+ 97% A 90% A- 87% B+ 84% B 80% B- 76% C+ 71% C 65%** **C- 58% D 50% F <50%**
Exams:	**COURSE POLICIES** **1) NO MAKE-UP or RESCHEDULING OF EXAMS (before or after exam date & 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 Friday Dec 12th at 8:00 – 10:30 am.*** **2) Exams and quizzes may cover material assigned in textbook, workbook, or in PowerPoint notes, but not necessarily covered in class**. Students are responsible for knowing all assigned reading material and homework problems. **3) The Instructor reserves the right to seat or move students during exams.** **4) 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).** **5) Cell phones, calculators, ipods, iphones, tablets, laptops and all other electronic devices are NOT allowed out on classroom desks during exams. Cell phones and anything with an on/off switch must be OFF during all exams and during class. If a phone rings during an exam, points may be deducted.** **6) Students are responsible for checking their exam scores posted on Desire2Learn Scantrons can be viewed during scheduled times in instructor's office. Any discrepancies need to be addressed within 1 week after grades have been posted on D2L.** Changes will not be made at the end of the semester. **7) Tuesday Oct 14th 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 reasons**, you should seek a hardship withdrawal or an incomplete. 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. 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): 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.

Suggestions for how to do well in Biochemistry:	**Biochemistry cannot be learned overnight, do NOT wait till the end to study.** **1)** Students are strongly encouraged to **download the lecture notes from Desire2Learn before coming to class.** ***Attendance at all classes is crucial to the student's success in this course***. Answers to blanks in notes will ONLY be available during class. **2) Students are strongly encouraged to carefully READ and STUDY the day's topic in the lecture notes and textbook BEFORE coming to class.** **3) Chapter outlines will be posted specifying topics covered from text. Specific problems will be assigned for each chapter from the workbook self-test questions & problems, and the text end-of-chapter problems.** It is recommended that problems be tried in this sequence for each chapter. Solutions to all problems (including those in text) are available in the workbook. **Practice exams** will also be posted for each class exam. **The exam is not a good place to do problems for the first time!** **4) Students are strongly encouraged to keep up with the material, read the text, review the notes, and do homework problems regularly after class and prior to the next class, as well as attend reviews often and ask questions.** **Material from each class is often used in next class, so STUDY biochemistry DAILY!** **5) Weekly quizzes** will be assigned **online using Desire2Learn, starting on Fridays;** quizzes will be due **before the start of the next class meeting** (Monday). **6) Announcements** will be posted on Desire2Learn, so please check on a daily basis, and between class meetings.
Cheating:	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 device during tests is also cheating. **A student who cheats on an exam will receive a zero for that exam, which cannot be dropped as the lowest grade.** Any suspected offenses may also be referred to the Department Chair for appropriate action. 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."

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

Date	Day	Chapter	*Amino Acids, Proteins and Hemoglobin Function*	Lecture No.
Aug 25	M*	1	Introduction to Course, Review: Intermolecular Interactions and Acid-Base Chemistry (pK_a)	1
Aug 27	W	1	Aqueous Biochemistry (Buffers) and Amino Acids	2
Aug 29 ***Q1***	F	2	Amino Acid Structures, Properties (pI) and Reactivity	3
Sept 1	***M***		***Labor Day Holiday, no class***	
Sept 3	W	2	Peptide Bonds, Peptide Charge and Secondary Structure	4
Sept 5 ***Q2***	F	2	3D Protein Structure (3^o & 4^o) and Protein Folding	5
Sept 8	M*	7	Hemoglobin Structure and Oxygen Transport	6
Sept 10	W	7	Hemoglobin Cooperativity & Allostery: Fine Tuning O_2 Binding Affinity	7
Sept 12 ***Q3***	F	3	Protein Purification and Proteins Review	8
Sept 15	M*	3	Protein Sequencing	9
Sept 17	**W**		**Exam 1 (Material from Chapters 1, 2, 7, 3)**	**10**

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

Date	Day	Chapter	***Enzymes: Kinetics, Catalytic Mechanisms and Regulation***	Lecture
Sept 19	F	8	Introduction to Enzymes	11
Sept 22	M*	8	Enzymes: Michaelis-Menten Kinetics	12
Sept 24	W	8	Enzymes: Inhibition	13
Sept 26 ***Q4***	F	9	Catalytic Strategies and Serine Proteases	14
Sept 29	M*	9	Chymotrypsin Mechanism and Specificity	15
Oct 1	W	10	Enzymes: Regulation	16
Oct 3 ***Q5***	F	9, 10	Chymotrypsin Regulation and Carbonic Anhydrase Mechanism	17
Oct 6	M*	11	Carbohydrates: Monosaccharide Structure and Reactivity	18
Oct 8	**W**		**Exam 2 (Material from Chapters 8, 9, 10, 3)**	**19**
			Carbohydrate Metabolism: Glycolysis and Glycogen	
Oct 10	F	11, 21	Disaccharides, Polysaccharides and Glycogen	20
Oct 13	M*	15	Overview and Thermodynamics of Metabolism	21
Oct 14	***T***		***Last day to Withdraw and possibly receive a W***	
Oct 15	W	15	Bioenergetics	22
Oct 17 ***Q6***	F	15, 16	Reactions of Metabolism and Glycolysis	23
Oct 20	M*	16	Glycolysis Reactions and Mechanisms	24
Oct 22	W	16	Glycolysis Reactions and Regulation	25
Oct 24 ***Q7***	F	16, 20	Gluconeogenesis and Overview of Pentose Phosphate Pathway	26
Oct 27	M*	21	Overview of Glycogen Metabolism	27
Oct 29	**W**		**Exam 3 (Material from Chapters 11, 15, 16, 21)**	**28**
			Energy Metabolism: Citric Acid Cycle, ATP & Fatty Acids	
Oct 31	F	17	Pyruvate Dehydrogenase Complex and Citric Acid Cycle	29
Nov 3	M*	17	Citric Acid Cycle (TCA)	30
Nov 5	W	12, 13	Membrane Structure and Transport Across Membranes	31
Nov 7 ***Q8***	F	18	Biochemical Oxidation-Reduction Reactions	32
Nov 10	M*	18	Electron Transport Chain (Q-cycle)	33
Nov 12	W	18	Oxygen Reduction Coupled to Proton Pumping	34
Nov 14 ***Q9***	F	17, 18	ATP Synthesis and Energy Output	35
Nov 17	M*	22	Overview of Fatty Acid Catabolism: Beta Oxidation	36
Nov 19	W	17, 23	TCA Regulation and Introduction to Amino Acid Metabolism	37
Nov 21	**F**		**Exam 4 (Material from Chapters 17, 18, 12, 13, 22)**	**38**
Nov 24-28	***M – F***		***Thanksgiving Break, no class***	
			DNA Replication &Gene Expression, Integration of Metabolism	
Dec 1	M*	4, 28	DNA Structure and Function	39
Dec 3	W	28	DNA Replication, Mutations and Repair	40
Dec 5 ***Q10***	F	30	Gene Expression: Transcription and Translation in Prokaryotes	41
Dec 8	M*	14	Signal Transduction: Hormonal Regulation of Metabolism	42
Dec 10	W**		Optional Final Exam Review	***optional*
Dec 12	**F**	**NEW DATE**	**Cumulative Final Exam – All Chapters Covered** ***Time: 8:00 am - 10:30 am*** **(includes Chapters 4, 28, 30)**	