Chem 332 Biochemistry II Spring 2023

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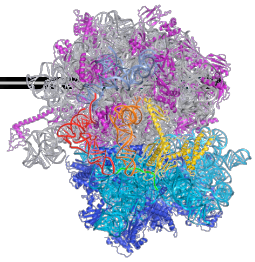
Phone: 260-7564 (office)
Learning Commons 210
Class Time: 9:05-10:00 M,W,F

***Biochemistry at work*:** In eukaryotes, the ribosome is composed of ~6,880 nucleotides of RNA and 79 proteins. Differences between bacterial and eukaryotic ribosome structures have been exploited to develop antibiotics.



Office Hours- In person – if you want a zoom meeting during one of these times, make a reservation by email:

Monday	10:00	Tuesday	4:00	Wednesday	3:30
Thursday	Appt	Friday	11:15		

I will be in my office (487), or my research laboratory (425) during office hours and pretty much most other times of the day. I don't care how busy I am I will make time for your questions and concerns.

Course Description: This course advances the fundamental concepts of macromolecules, structure/function paradigms, enzyme mechanism & activity and metabolism gained in CHEM 331. We will study metabolic homeostasis, integrating anabolic/catabolic pathways and energy flux with nutrition/nutrient intake of essential and non-essential molecules. Regulatory control through allosteric, transcriptional/translational, and post-translational mechanisms will be examined as part of maintaining metabolic homeostasis. Where relevant, disease and pathology will be used to highlight these concepts. We will study signal transduction to address the flow of information within a system. As a capstone to our in-depth study of biochemistry, we will examine cross-disciplinary applications of core biochemical concepts (structure/function, homeostasis, energy flow and information flow) in the context of systems biology, chemical biology and synthetic biology.

Expected Learning Outcomes:

1. Understand the basics of advanced biochemical metabolic pathways.
2. Given a starting macromolecule, predict the metabolic pathway, site(s) of regulation and thermodynamic principles driving its metabolism.
3. Assess role of metabolic pathway in specific tissues and in maintaining nutritional homeostasis of an organism under normal versus disease state.
4. Justify regulatory mechanisms (covalent or small molecule) employed by metabolic pathways and evaluate the structural and kinetic impact of regulatory molecule on the output of the protein/pathway/system.
5. Understand the signaling components controlling biochemical processes.
6. Predict or design models of information transfer cascades of commonly encountered signal transduction mechanisms.
7. Given thermodynamic input, macromolecule structure/function, students should justify evolutionary driving forces for large biochemical systems.
8. Apply fundamental biochemical knowledge to understand systems and big data science; understand current questions in selected cross-disciplinary topics, and begin to predict/design their own application in the field.

Resources:
(a) Lectures: The most important topics are always identified in class, and are usually discussed in detail. Attending class and accurate note-taking are the only way to learn the material.
(b) Textbook Required: Fundamentals of Biochemistry, Voet, Voet and Pratt 4th Edition. The material in the book will clarify points, fill in gaps, and extend your knowledge. Portions of selected lectures will come from current literature and handouts. *Reading the book is required, not suggested.*
(c) Help sessions: We will have the help sessions as the schedule allows. Please do not hesitate to make an appointment to ask questions. I believe that there is no such thing as a stupid question. Your questions are the best guide I have to your particular needs. If you do not know enough to phrase a question, then meet with me and we can work it out.
(d) Website: The website will have ppt handouts, learning objectives/study guides and suggested study questions.

Grades: There will be four examinations. Each regular examination will be normalized to 300 pts each. The grade cut offs are A-92%, B-80%, C-70%, D-60% and F-50%. These are tentative, may be decreased but will not be increased. Learning objectives and chapter questions will be provided but not graded. ***Make-up examinations***: These will be given only for major, documented emergencies (severe illness, death in family…) ***prior notice*** is required.

- Three Exams (300 points each)	900 points
- Metabolism Case Study	25 points
- PEPCK Paper Assignment	25 points
- Cell Signal Paper Assignment	25 points
- Cancer Paper Assignment	25 points
	Total 1000 points

Academic Integrity: Review the Student Code of Rights and Responsibilities and Rules of Conduct (http://www.sandiego.edu/conduct/the_code). In particular, familiarize yourself with the Academic Integrity Policy, which is found under "University Policies". You will need your MySanDiego username and password to view the policy.

Tentative Schedule – we will adjust based on progress of the class and pace of discussion.

Date	Topic	Chapter
Fri Jan 27	Introduction / Glycolysis Review	15 (1-4)
Mon Jan 30	Krebs Cycle	17 (1-4)
Wed Feb 1	Krebs Cycle	17 (1-4)
Fri Feb 3	Krebs Cycle	17 (1-4)
Mon Feb 6	ETS / Oxidative Phosphorylation	18
Wed Feb 8	ETS / Oxidative Phosphorylation	18
Fri Feb 10	ETS / Oxidative Phosphorylation	18
Mon Feb 13	Glycogen Metabolism	16 (1-3)
Wed Feb 15	Glycogen Metabolism	16(1-3)
Fri Feb 17	Glycogen Metabolism / Gluconeogenesis	16(4)
Mon Feb 20	Lipid Metabolism	20
Wed Feb 22	Lipid Metabolism	20
Fri Feb 24	Lipid Metabolism	20
Mon Feb 27	**Exam I**	
Wed Mar 1	Metabolic Integration	22
Fri Mar 3	Metabolic Integration	22
Mar 6-10	*Spring Break*	
Mon Mar 13	PEPCK Papers	Web linked pubs
Wed Mar 15	PEPCK Papers	Web linked pubs
Fri Mar 17	Cell Signaling	13
Mon Mar 20	Cell Signaling	13
Wed Mar 22	Cell Signaling	13
Fri Mar 24	Cell Signaling	13
Mon Mar 27	Cell Signaling	13
Wed Mar 29	Cell Signaling	13
Fri Mar 31	**Exam II**	
Mon Apr 3	Cell Signaling Paper Presentation / Discussion	Web linked pubs
Wed Apr 5	Cell Signaling Paper Presentation / Discussion	Web linked pubs
Fri Apr 7	*Easter Break*	
Mon Apr 10	*Easter Break*	
Wed Apr 12	DNA/RNA Structure and Protein Binding	24(1-4)
Fri Apr 14	DNA Repair	25
Mon Apr 17	DNA Repair	25
Wed Apr 19	CRISPR	Web Links
Fri Apr 21	Transcription and RNA Processing.	26
Mon Apr 24	Transcription and RNA Processing.	26
Wed Apr 26	Protein Synthesis	27
Fri Apr 28	Protein Synthesis	27
Mon May 1	Biochemistry of Cancer – Introduction and Nature of Cancer	28(4)
Wed May 3	Biochemistry of Cancer – Cancer Metabolism and Warburg Effect	Web Links and Bb
Fri May 5	Biochemistry of Cancer – Cellular Oncogenes	Web Links and Bb
Mon May 8	Biochemistry of Cancer – Tumor Suppressors	Web Links and Bb
Wed May 10	Biochemistry of Cancer – p53 and Apoptosis	Web Links and Bb
Fri May 12	Biochemistry of Cancer – Invasion and Metastasis	Web Links and Bb
Mon May 15	Biochemistry of Cancer – Treatment of Cancer	Web Links and Bb
Mon May 24	**Final / Exam III 8:00 – 10:00**	