

Section 1, 3 credits, 150 min/week, #46733
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Office Hours: By appointment.

Goals: This course is one of the four core graduate level biochemistry courses offered at USU. This course will focus on a detailed analysis of the principles of energy transformations in living systems. This will include a general introduction to energy requirements for living systems, thermodynamics relevant to biochemistry, core energy pathways (e.g., substrate level and oxidative phosphorylation, photosynthesis, etc.), and the diversity of fueling reactions found in living organisms. Students will gain in depth knowledge from specialty text books, current reviews, and primary literature on these topics.

Meetings Total contact time for this course will be ~2000 min (equivalent to forty-50 min lectures). The lecture days and times will be established after the first week of classes and will be arranged as 2-3 lectures per week for 50 to 75 min each.

Text: A current high level biochemistry text book such as *Lehninger Principles of Biochemistry*, 4th edition, 2005, by Nelson and Cox is recommended as background reading. This book is available for purchase in the bookstore, but any current edition biochemistry book should work fine. Content beyond the text book level will be drawn from a variety of specialty books, current review articles, and the primary literature. Materials for the course, including literature, will be available on the course WebCT page.

Prerequisites: A full year of undergraduate organic chemistry; a comprehensive upper division undergraduate course in biochemistry (comparable to CHEM 5700-5710 at USU), with physical chemistry recommended.

Online Info: Classroom handouts, class standings, exam keys, etc. will be available on the course WebCT page at webct.usu.edu. Username = banner ID; password = banner pin.

Exams: There will be two, one hour examinations worth 100 points each during the course and a two hour final examination worth 150 points. The two exams will be limited to 75 min and will be given in class. The final exam will be comprehensive, although approximately 50% of the final examination will cover material presented since the last exam. Missed exams will be scored as a zero. Make-up exams are possible only for excused absences by prior appointment.

Problem Sets: Two problem sets, worth 50 points each, will be distributed during the course and will be due in class one week after they are assigned.

Grading:	Two hourly exams @ 100 points each.....	200 pts.
	Two problem sets @ 50 points each	100 pts
	Comprehensive final exam.....	<u>150 pts.</u>
	TOTAL.....	450 pts.

Provisions: The administration of this course will adhere strictly to the regulations outlined in the Fall Semester Schedule of Classes.

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in Chem 6760. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.

I. Core Concepts in Bioenergetics

- Thermodynamics
- First and Second Laws
- Equilibria, Free Energy
- Electrochemistry/Electron Transfer

II. Core Metabolism

- Overview
- Glycolysis
- TCA
- Fatty Acid Metabolism
- Amino Acid Metabolism
- Oxidative Phosphorylation
- Photophosphorylation
 - Anoxygenic
 - Oxygenic

III. Metabolic Diversity

- Overview
- Chemolithotrophy
- Hydrogen Oxidation
- CO Oxidation
- Sulfur Oxidation
- Iron Oxidation
- Nitrification
- Methanotrophy and Methylotrophy
- Anaerobic Respiration
- Denitrification
- Sulfate Reduction
- Acetogenesis
- Methanogenesis
- Hydrocarbon Transformations
- Nitrogen Fixation