Chemistry 562
Intermediary Metabolism
Spring 2018

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Course time: 11:00-11:50 a.m., Mon. & Wed., GMCS 314

Office hours: 12:00-1:00 p.m. Monday; 8:30-10:00 a.m. Tuesday, OR
Call or e-mail to make an appointment, OR
Drop by my lab (CSL 325)

Textbooks: Fundamentals of Biochemistry, Fourth Edition (2012)
D. Voet, J. Voet & C.W. Pratt (John Wiley & Sons, Inc.)
Note: You may also use the old Third Edition (2008) or new Fifth Edition (2016)

The course:

Prerequisites-General Biochemistry (Chem 560) OR Biochemistry, Cell & Molecular Biology I (Chem 365)

Course description-This is one of three upper division biochemistry lecture courses, with Chem 563 (Nucleic Acid Function and Protein Synthesis) and Chem 564 (Receptor Biochemistry and Protein Modification), that complete an advanced undergraduate education in biochemistry. Metabolism refers to the complete set of chemical reactions that sustain life. Metabolism begins with the extraction of energy from environmental sources such as sunlight and reduced organic compounds and its conversion to more useful chemical forms such as ATP and the reductive potential of NADH and NADPH. It also encompasses all of the synthetic processes required to build up and maintain a cell (anabolism) as well as the breakdown of complex cellular structures into simpler biomolecules (catabolism). The entire process is highly regulated. Therefore, metabolism resides at the interface between organic chemistry, physical chemistry (thermodynamics and energy transfer), and enzymology. The goal of this course is to provide advanced students of biochemistry with a detailed understanding of the fundamental biochemistry that supports all living things. Students with an interest in pharmaceuticals and medicine will gain an understanding of the biochemical processes that underly metabolic diseases.

Expected student learning objectives-
Each student who successfully completes this course will be able to:

(i) show familiarity with the global concepts of metabolism and its regulation, homeostasis, and organ specialization
(ii) express in chemical detail the core metabolic pathways of glycolysis, the citric acid cycle, and electron transport/oxidative phosphorylation;
(iii) describe in chemical detail the light and dark reactions of photosynthesis;
(iv) detail the anabolic and catabolic processes that regulate the synthesis and breakdown of fatty acids

***Please note-*To be successful in this course, you must develop a working familiarity with a vast amount of material. Be prepared to dedicate sufficient time each week to stay current with your reading and studying. You will need to read an average of 15-30 pages of text each week. However, not all of the chapters will be covered in their entirety. Please consult the "Reading" column in the lecture schedule on pages 3 and 4 of this syllabus to identify chapter pages from which exam material will be taken.**

Resources available to students-The text is the primary resource for this course. Lectures will closely follow the sequence and organization of the textbook. A short list of "lecture goals" will be highlighted at the beginning of each lecture. The purpose of outlining the lecture goals is to aid students in studying for exams. The slides used in lectures will be posted to the Blackboard site at least 24 hours prior to lecture. This is to aid students in note taking and reinforce the lecture goals during study. Make good use of office hours to ask questions about material you find confusing before you encounter it on your exam.

Homework-There will be nine graded homework assignments. These will be posted regularly to the Blackboard site. The purpose of these problem sets is to help students think critically about the material and prepare for exams. You are encouraged to work together in groups and it is also highly recommended that students bring questions that arise while working on these problems to office hours.

Exams and grading-There will be nine homework assignments, two mid-term exams, and a cumulative final. The point distribution is as follows:

Homework assignments 1-9 (you are encouraged to work together in groups) 10 points each plus 10 points for turning in all nine assignments, **100** points total

Mid-term exams 1 and 2 (50 min) 100 points each, **200** points total

Final exam (120 min) **150** points—the final exam is cumulative.

Total 450 points

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SCHEDULE

Date	**Topic (Lecture number)**	**Reading**
Jan 17	Introduction Overview of metabolism (1)	
Jan 22	"High-energy" compounds (2)	Ch. 14 (436-456)
Jan 24	Oxidation-reduction reactions (3) **Homework #1 due**	Ch. 14 (456-461)
Jan 29	Experimental approaches to the study of metabolism (4)	Ch. 14 (462-468)
Jan 31	NO CLASS — AHA REVIEW PANEL	
Feb 5	The reactions of glycolysis: Phase I (5)	Ch. 15 (472-482)
Feb 7	The reactions of glycolysis: Phase II (6) **Homework #2 due**	Ch. 15 (483-491)
Feb 12	Glycolysis: fermentation and regulation (7)	Ch. 15 (491-501)
Feb 14	Metabolism of alternative hexoses The pentose-phosphate pathway (8) **Homework #3 due**	Ch. 15 (502-513)
Feb 19	Breakdown and synthesis of glycogen (9)	Ch. 16 (517-530)
Feb 21	Regulation of glycogen metabolism (10)	Ch. 16 (530-538)
Feb 26	Gluconeogenesis (11)	Ch. 16 (538-545)
Feb 28	Catch up/Review **Homework #4 due**	
Mar 5	**Exam 1** (Lectures 1-11)	
Mar 7	Generation of acetyl-CoA (12)	Ch. 17 (551-560)
Mar 12	The citric acid cycle (13)	Ch. 17 (560-568)

Mar 14	Regulation of the citric acid cycle (14) **Homework #5 due**	Ch. 17 (568-574)
Mar 19	Mitochondria and electron transport (15)	Ch. 18 (581-603)
Mar 22	Oxidative phosphorylation (16)	Ch. 18 (603-614)
Mar 26	NO CLASS — SPRING RECESS	
Mar 28	NO CLASS — SPRING RECESS	
Apr 2	Photosynthesis: chloroplasts and prokaryotic photosystems (17) **Homework #6 due**	Ch. 19 (623-628)
Apr 4	Photosynthesis: the light reactions (18)	Ch. 19 (628-643)
Apr 9	Photosynthesis: the dark reactions (19) **Homework #7 due**	Ch. 19 (644-649)
Apr 11	Lipid digestion, absorption, and transport (20)	Ch. 20 (657-664)
Apr 16	Fatty acid oxidation (21) **Homework #8 due**	Ch. 20 (664-678)
Apr 18	Fatty acid biosynthesis (22)	Ch. 20 (680-691)
Apr 23	Catch up/Review **Homework #9 due**	
Apr 25	**Exam 2** (Lectures 12-22)	
Apr 30	Protein degradation (23)	Ch. 21 (712-718)
May 2	Amino acid deamination The urea cycle (24)	Ch. 21 (718-727)
May 7	**Final exam** (Lectures 1-24) **10:30 a.m. - 12:30 p.m.** **GMCS 314**	