Chemistry 562
Intermediary Metabolism
Spring 2017

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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 office or lab (CSL 325)

Textbooks: Fundamentals of Biochemistry, Fourth Edition (2013)
D. Voet, J. Voet & C.W. Pratt (John Wiley & Sons, Inc.)
Note: You may also use the old Third Edition (2008)

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 18	Introduction Overview of metabolism (1)	
Jan 23	"High-energy" compounds (2)	Ch. 14 (436-456)
Jan 25	Oxidation-reduction reactions (3)	Ch. 14 (456-461)
Jan 30	Experimental approaches to the study of metabolism (4) **Homework #1 due**	Ch. 14 (462-468)
Feb 1	The reactions of glycolysis: Phase I (5)	Ch. 15 (472-482)
Feb 6	The reactions of glycolysis: Phase II (6) **Homework #2 due**	Ch. 15 (483-491)
Feb 8	Glycolysis: fermentation and regulation (7)	Ch. 15 (491-501)
Feb 13	Metabolism of alternative hexoses The pentose-phosphate pathway (8)	Ch. 15 (502-513)
Feb 15	Catch up/Review **Homework #3 due**	
Feb 20	**Exam 1** (Lectures 1-8)	
Feb 22	Breakdown and synthesis of glycogen (9)	Ch. 16 (517-530)
Feb 27	Regulation of glycogen metabolism (10)	Ch. 16 (530-538)
Mar 1	Gluconeogenesis (11)	Ch. 16 (538-545)
Mar 6	Generation of Acetyl-CoA (12) **Homework #4 due**	Ch. 17 (551-560)
Mar 8	The citric acid cycle (13)	Ch. 17 (560-568)
Mar 13	Regulation of the citric acid cycle (14) **Homework #5 due**	Ch. 17 (568-574)

Mar 15	Mitochondria and electron transport (15)	Ch. 18 (581-603)
Mar 20	Oxidative phosphorylation (16)	Ch. 18 (603-614)
Mar 22	**Exam 2** (Lectures 9-14) **Homework #6 due**	
Mar 27	NO CLASS — SPRING RECESS	
Mar 29	NO CLASS — SPRING RECESS	
Apr 3	Photosynthesis: chloroplasts and prokaryotic photosystems (17)	Ch. 19 (623-628)
Apr 5	Photosynthesis: the light reactions (18)	Ch. 19 (628-643)
Apr 10	Photosynthesis: the dark reactions (19) **Homework #7 due**	Ch. 19 (644-649)
Apr 12	Lipid digestion, absorption, and transport (20)	Ch. 20 (657-664)
Apr 17	Fatty acid oxidation (21) **Homework #8 due**	Ch. 20 (664-678)
Apr 19	Fatty acid biosynthesis (22)	Ch. 20 (680-691)
Apr 24	Protein degradation (23)	Ch. 21 (712-718)
Apr 26	Amino acid deamination The urea cycle (24) **Homework #9 due**	Ch. 21 (718-727)
May 1	Organ specialization (25)	Ch. 22 (791-799)
May 3	Catch up/Review	
May 8	**Final exam** (Lectures 1-25) **10:30 a.m. - 12:30 p.m.** **GMCS 314**	