Chemistry 562
Intermediary Metabolism
Spring 2019

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Course time: 11:00-11:50 a.m., Mon. & Wed., HT 183

Office hours: Tues. 1:00 - 2:00 p.m. and Wed. 9:00 - 10:30 a.m., OR
Call or e-mail to make an appointment

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 no graded homework assignments. Nine "Problem Sets" with challenging sample questions will be posted regularly on the Blackboard site, as will their "Answer Keys." The purpose of these problem sets is to help students prepare for exams. It is highly recommended that students attempt these problems, as well as exercises from the back of the Chapters, work in groups, and seek help from the instructor if they find the problems too difficult to solve.

Exams and grading-There will be three mid-term exams, and a cumulative final exam. The point distribution is as follows:

- Mid-term Exams (75 min) 100 points each, **300** points total
- Final exam (120 min) **160** points—the final exam is cumulative. Note: Your percentage score on the final exam can be used to replace the lowest of your three mid-term exam scores. Alternatively, you may choose to opt out of taking the final exam and, instead, accept your existing percentage (out of 160 points possible) as your final exam score.

Course grades will be assigned based on total points earned out of 460 points possible

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SCHEDULE

Date	Topic (Lecture number)	Reading
Jan 23	Introduction Overview of metabolism (1)	
Jan 28	"High-energy" compounds (2)	Ch. 14 (436-456)
Jan 30	Oxidation-reduction reactions (3)	Ch. 14 (456-461)
Feb 4	Experimental approaches to the study of metabolism (4)	Ch. 14 (462-468)
Feb 6	The reactions of glycolysis: Phase I (5)	Ch. 15 (472-482)
Feb 11	The reactions of glycolysis: Phase II (6)	Ch. 15 (483-491)
Feb 13	Glycolysis: fermentation and regulation (7)	Ch. 15 (491-501)
Feb 18	Metabolism of alternative hexoses The pentose-phosphate pathway (8)	Ch. 15 (502-513)
Feb 20	Catch up/Review	
Feb 25	**Exam 1** (Lectures 1-8)	
Feb 27	Breakdown and synthesis of glycogen (9)	Ch. 16 (517-530)
Mar 4	Regulation of glycogen metabolism (10)	Ch. 16 (530-538)
Mar 6	Gluconeogenesis (11)	Ch. 16 (538-545)
Mar 11	Generation of acetyl-CoA (12)	Ch. 17 (551-560)
Mar 13	The citric acid cycle (13)	Ch. 17 (560-568)
Mar 18	Regulation of the citric acid cycle (14)	Ch. 17 (568-574)
Mar 20	Mitochondria and electron transport (15)	Ch. 18 (581-603)
Mar 25	Oxidative phosphorylation (16)	Ch. 18 (603-614)
Mar 27	**Exam 2** (Lectures 9-16)	

Apr 1	NO CLASS — SPRING RECESS	
Apr 3	NO CLASS — SPRING RECESS	
Apr 8	Photosynthesis: chloroplasts and prokaryotic photosystems (17)	Ch. 19 (623-628)
Apr 10	Photosynthesis: the light reactions (18)	Ch. 19 (628-643)
Apr 15	Photosynthesis: the dark reactions (19)	Ch. 19 (644-649)
Apr 17	Lipid digestion, absorption, and transport (20)	Ch. 20 (657-664)
Apr 22	Fatty acid oxidation (21)	Ch. 20 (664-678)
Apr 24	Fatty acid biosynthesis (22)	Ch. 20 (680-691)
Apr 29	Protein degradation (23)	Ch. 21 (712-718)
May 1	Amino acid deamination The urea cycle (24)	Ch. 21 (718-727)
May 6	**Exam 3** (Lectures 17-24)	
May 8	Review for final	
May 13	**Final exam** (Lectures 1-24) **10:30 a.m. - 12:30 p.m.** **HT 183**	