

**Chemistry 491/591**  
**Biochemistry: Enzymology and Metabolism**

**Winter 2008**  
**MWF 11:30-12:35**

Professor: Dirk Iwata-Reuyl  
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Office hours: **MW** 1:00-2:00 pm, or by appointment.

Text: Voet & Voet, "Biochemistry," 3<sup>rd</sup> ed., Wiley, 2003.

Prerequisites: 1 year of Organic Chemistry  
CH 490 (Biochemistry I)

Web-CT: Syllabus, homework problems, old exams, lecture figures.

Reserve: Zubay, "Biochemistry," 4<sup>th</sup> ed., 1998.

Course Overview: Chemistry 491/591 is the second of a three-term sequence in biological chemistry. The course stresses the application of chemical and physical principles to the primary metabolic pathways responsible for life. While the lectures will generally follow the sequence of topics presented in the book, in some cases they will cover material not presented in the textbook, or provide more detail than the textbook. The schedule below should be considered *fluid and subject to change*.

Grading: For students registered in CH 491, grading will be based on two mid-term exams (each worth 20% of the grade), the final exam (worth 40% of the grade), and homework (worth 20%). For students registered in CH 591, in addition to the mid-term and final exams (worth 20% and 40%, respectively) and homework (worth 10%), the course grade will include two research papers (worth 10% of the grade) on a topic of modern biochemistry taken from the recent literature. Extra credit for all students can be earned (up to 5%) by attending the Chemistry department seminars (a total of 4) when the topic is biochemical in nature and providing a one page typed summary, *due in class one week after the seminar*. For those who are unable to attend the Chemistry seminars due to scheduling conflicts, attendance at other departmental seminars (PSU, OHSU, or others) when the topic is relevant is acceptable for extra credit. The latter options must be cleared by me in advance.

Exams: The first exam will cover material through January 28<sup>th</sup>. The second exam will cover the material since the first exam, up to and including the material of February 18<sup>th</sup>. Approximately half of the final exam will cover material introduced since the second mid-term, and the remainder will cover the entire course. In order to ensure that everyone has plenty of time to complete the mid-term exams, two hours will be provided for completing them. Likewise, four hours will be provided for the final exam. If you are unable to take either of the mid-term exams or the final exam during the scheduled time, you may arrange to take the exams at an alternate time on the day the exams are scheduled. These arrangements must be made by **January 18<sup>th</sup>** for the first exam, **February 18<sup>th</sup>** for the second exam, and **March 10<sup>th</sup>** for the final exam. Make-up exams will be allowed only for the most *extreme* of extenuating circumstances (*i.e.* death of a family member or personal hospitalization), and official documentation must be provided to substantiate any claims. A scientific calculator capable of +, -, x, /, logarithms, powers and roots is required. **Note:** NO programmable calculators or calculators capable of any type of information storage will be allowed during exams. It is your responsibility to bring an appropriate calculator to the exams.

Homework: Homework will be assigned periodically throughout the term, and will be due in class exactly one week after being handed out. Late assignments will be marked down 5% per day. In addition I *highly recommend* that everyone work the problems at the end of each chapter in the text. I have also placed a supplementary text that provides additional problems on reserve in the library, and the problem/solution manual is available in my office (you are welcome to make copies for yourself). I cannot over-emphasize the importance of working problems.

I hear, and I forget,  
I see, and I remember,  
I do, and I understand.  
Ancient Chinese Proverb

Research Papers (CH 591 only): These should *critically evaluate* a primary journal article from the current literature (within the past 12 months). Articles chosen should address an issue of biological structure/function at the molecular level relevant to the focus of the class. Papers should be 3-4 pages in length, typed and, when other sources are used, fully referenced. Although spelling and grammar will not be explicitly graded, a poorly written paper and/or bad spelling will result in a lower grade.

Paper topics must be cleared by me *no later than January 28<sup>th</sup>* (remember, if I don't approve your choices you will have to find others, so don't put this off until the last moment), and copies of the papers provided to me. The first paper is due on *February 18<sup>th</sup>*, and the second is due on *March 10<sup>th</sup>*. Late papers will be marked down 5% per day. The following journals are good sources (but by no means the *only* sources) for the papers:

<p><i>Science</i> <i>Biochemistry</i> <i>Journal of Biological Chemistry</i> <i>EMBO Journal</i></p>	<p><i>Nature</i> <i>Journal of the American Chemical Society</i> <i>Chemistry and Biology</i> <i>Proceedings of the National Academy of Sciences</i></p>
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## Syllabus

Date	Reading	Topic
Jan. 7	Chap. 13 (sec 1-3,5) Chap. 14 (sec 1)	Introduction, basic chemical kinetics
Jan. 9	Chap. 14 (sec 2)	Enzyme kinetics
Jan. 11	Chap. 14 (sec 3-5)	Bisubstrate reactions and inhibition
Jan. 14	Chap. 16 (sec 1-2)	Biochemical reactions and organic mechanisms
Jan. 16	Chap. 15 (sec 1) Chap. 16 (sec 3)	Mechanisms of enzyme catalysis/ thermodynamics of ATP
Jan. 18	Chap. 16 (sec 4) Chap. 17 (sec 1-2)	Glycolysis

Jan. 21	<b>University Holiday</b> (Martin Luther King Jr. Birthday)	
Jan. 23	Chap. 17 (sec 2-3)	Glycolysis/fermentation
Jan. 25	Chap. 13 (sec 4)	Regulation of enzymatic activity
Jan. 28	Chap. 17 (sec 4-5)	Regulation of Glycolysis/metabolism of other hexoses
Jan. 30	Chap. 18 (sec 1-2)	Glycogen Metabolism
Feb. 1	<b>Mid-Term Exam</b>	
Feb. 4	Chap. 18 (sec 3) Chap. 21 (sec 1-2)	Glycogen regulation/intro to TCA cycle
Feb. 6	Chap. 21 (sec 3)	TCA cycle
Feb. 8	Chap. 21 (sec 4-5)	TCA cycle
Feb. 11	Chap. 16 (sec 4) Chap. 22 (sec 1-2)	Electron transport
Feb. 13	Chap. 22 (sec 2-3)	Electron transport
Feb. 15	Chap. 22 (sec 3-4)	Electron transport/oxidative phosphorylation
Feb. 18	Chap. 23 (sec 1-2)	Glyconeogenesis/glyoxylate cycle
Feb. 20	Chap. 23 (sec 4)	Pentose phosphate pathway
Feb. 22	<b>Mid-Term Exam</b>	
Feb. 25 – Mar. 14		The class will choose 2 of the following 3 topics to cover during the remaining 3 weeks of the term: Photosynthesis (Ch 24), fatty acid metabolism (Ch 25), or amino acid metabolism (Ch 26).
Mar. 20	<b>Final Exam</b>	Thursday, 12:30 - 4:30 PM