

Organic Chemistry III CHEM 446
RM 2122
(Time: Tues, Thurs 9:35-10:50AM)

Office Hours

Tues./Thurs. 10:50-11:50AM

Required Texts

“The Organic Chemistry of Enzyme-Catalyzed Reactions,” Richard B. Silverman, Academic Press, 2002.

“Medicinal Natural Products, A Biosynthetic Approach,” Paul M. Dewick, John Wiley & Sons, 1997.

Course Requirements

Exam 1	20% (100 pts)
Exam 2	20% (100 pts)
Exam 3	20% (100 pts)
Final Exam	30% (150 pts)
Class Participation	10% (50 pts)

Class participation is based on class attendance, attendance at problem sessions, and participation in class discussions and problem sessions. The course is graded on a curve and there are lots of opportunities to earn extra credit.

Abstract of Course

Secondary metabolites are substances produced primarily by microorganisms, marine invertebrates, and plants, many of which exhibit a wide range of biological activities. The objective of this course is to provide an understanding of the way these substances are made *in vivo*, *i.e.* their biosynthesis that is important not only from a biosynthetic perspective, but also from a synthetic and genetic engineering standpoint as well. An emphasis will be placed on enzyme mechanisms that build upon fundamental concepts covered in basic organic chemistry. The course will conclude with basic molecular biology strategies including cloning techniques and genetic knockout approaches that are extensively utilized today in the investigation of natural product biosynthesis/engineering. The information gleaned from this course should provide a solid foundation for those intending to pursue scientific careers at the interface of chemistry and biology.

Tentative Schedule

Week 1 (Jan. 18, 20)

Lecture 1	Introduction to Course Introduction to Proteins and Enzymes
Lecture 2	Chirality and Prochirality

Week 2 (Jan. 25, 27)

Lecture 1	Formylations, Hydroxymethylations, and Methylations
Lecture 2	Reduction and Oxidation

Week 3 (Feb. 1, 3)

Lecture 2 Monooxygenation

Lecture 3 Dioxygenation

Week 4 (Feb. 8, 10)

Lecture 1 Carboxylation and Decarboxylation (for exam 2)

Lecture 2 Problem/Game Session

Week 5 (Feb. 15, 17)

Lecture 1 **Exam 1**

Lecture 2 Fatty acids (biosynthesis vs. degradation)

Week 6 (Feb. 22, 24)

Lecture 1 Fatty acids (Type I and II enzymes, phosphopantethienylation, tuberculosis)

Lecture 2 Eicosanoids (prostaglandins, leukotrienes, Cox 1 and II inhibition)

Week 7 (Mar. 1, 3)

Lecture 1 No class

Lecture 2 Polyketides

Week 8 (Mar. 8, 10)

Lecture 1 Polyketides

Lecture 2 Problem/Game Session

Week 9 (Mar. 15, 17)

Lecture 1 **Spring Break (No Classes)**

Lecture 2 **Spring Break (No Classes)**

Week 11 (Mar. 22, 24)

Lecture 1 **Exam 2**

Lecture 2 Non-ribosomal Polypeptides

Week 12 (Mar. 29, 31)

Lecture 1 Terpenes

Lecture 2 Terpenes

Week 13 (Apr. 5, 7)

Lecture 1 Alkaloids

Lecture 2 Problem/Game Session

Week 14 (Apr. 12, 14)

Lecture 1 **Exam 3**

Lecture 2 Alkaloids

Week 15 (Apr. 19, 21)

Lecture 1 Shikimate (aromatic amino acids, quinones and derivatives)

Lecture 2 Sugars (amino sugars, deoxysugars, modified sugars)

Week 16 (Apr. 26, 28)

Lecture 1 PCR, Mutagenesis and Gene Knockout Strategies

Lecture 2 Problem Session/Game Session

Week 17-18 (May)

Final