

CHE 450  
Physical Organic Chemistry  
Spring 2005

**Course Description:** A study of the reactions of organic compounds and the mechanisms of these reactions. Experimental evidence is emphasized, enabling students to analyze data and propose mechanistic explanations. A variety of reactions are examined, including nucleophilic substitutions and pericyclic reactions. Students learn to interpret various types of experiments including: thermochemistry, kinetics, isotope effects, stereochemistry, and solvent effects. Prerequisite: CHE 341 and 361.

**Text:** Perspectives on Structure and Mechanism in Organic Chemistry by Felix A. Carroll, Brooks/Cole: Pacific Grove, CA, 1998.

**Instructor:** [Jennifer Muzyka](mailto:muzyka@centre.edu), Olin 241, 238-5413, [muzyka@centre.edu](mailto:muzyka@centre.edu).

**Office Hours:** MWF 9-10; T 9-11 and by appointment. ([See my schedule](#))

**Website:** <http://web.centre.edu/muzyka/che450/>

**Grading:**

Exams (3)	50%
Paper and Presentation	15%
Homework	10%
Final Exam	25%

Attendance is expected at every class meeting, and will be monitored. Late homework will not be accepted.

**Tests.** There will be three in-class exams and one final exam. If a test is missed due to illness or personal emergency, a written, verifiable excuse must be submitted before a make-up test will be given. Every student is required to take the comprehensive final exam at the end of the term during the assigned exam period.

**Homework.** Homework will be assigned on a regular basis. The homework problems may involve material that we will cover in the next class, encouraging you to prepare for class in advance.

**Paper and Presentation.** Students will choose a paper from the chemical literature to examine in detail, using tools learned in the course. These detailed analyses will result in a written paper and an oral presentation in class.

<b>Date</b>	<b>Chapter</b>	<b>Topic</b>
Feb 2	1	Bonding and Molecular Geometry
4	1	Complementary Descriptions of Double Bond
7	2	Stereoisomerism
9	2	Manifestations of Stereoisomerism
11	3	Molecular Conformation
14	3	Conformational Analysis
16	3	Molecular Mechanics
18	3	Molecular Strain and Limits to Molecular Stability
21	4	Molecular Orbital Theory
23	4	Aromaticity
25	4	Valence Bond Theory
28		Test 1
March 2	5	Potential Energy Surfaces & Reaction Coordinate Diagrams
4	5	Reactive Intermediates
7	6	Molecular Change and Tools to Determine Reaction Mechanisms
9	6	Kinetics in studying reaction mechanisms
11	6	Arrhenius theory and transition state theory
14	6	kinetic isotope effects
16	6	Substituent Effects and Linear Free Energy Relationships
18	7	Acidity and Basicity of Organic Compounds
28	7	Acid and Base Catalysis of Chemical Reactions
30	7	Acid/base catalyzed reactions of carbonyl compounds and acid derivative
April 1		Test 2
4	8	Nucleophilic Aliphatic Substitution
6	8	Nucleophilic
8	8	Electrophilic Aromatic Substitution
11	8	Nucleophilic aromatic and vinyl substitution
13	11	Electrocyclic Transformations
15	11	Sigmatropic Reactions
18	11	Cycloaddition Reactions
20	11	Other Concerted Reactions & Selection Rules for Pericyclic Reactions
22	12	Photochemistry Introduction
25	12	Properties of Excited States
27	12	Representative Photochemical Reactions

29	12	Applications of Organic Photochemistry
May 2		Test 3
4		Presentations
6		Presentations
9		Presentations
May 17		Final Exam, 1:30-4:30 p.m.