Chemistry 420 - Advanced Organic Chemistry I

Section 1 (Class # 16431)

Fall, 2009 Tu-Th 1:30-3:10pm PS 306

Instructor: Prof. Alison McCurdy
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PS709, 323-343-2362

Office Hours: : T, Th 4-5pm; M, W 8:45-9:45am
and by appointment

Required Texts: *Chem 420 Course Reader* Available at the Student Book Mart and Copy Center (323) 262-5511; 1725A N. Eastern Ave. This reader consists of chapters from the following 3 texts:

- Modern Physical Organic Chemistry by Eric Anslyn and Dennis Dougherty
- Perspectives on Structure and Mechanism in Organic Chemistry by Felix Carroll
- Advanced Organic Chemistry Reactions and Mechanisms by Bernard Miller

Any handouts given in class

Course Page URL: http://instructional1.calstatela.edu/amccurd/

Prerequisite: Chem 301C and (401 or 403).

University Add/Drop Policy

1. Deadline to add classes - October 8, 2009
2. Deadline to drop class with no record - October 1, 2009
3. "W" drop period begins - October 2 (see Fall, 2009 Catalog p 10 for conditions).

Academic Honesty:
Students are expected to abide by the University's Academic Honesty Policy, which can be found at http://www.calstatela.edu/usu/csi/StudentRights15.html

Course Description:
This course focuses on theoretical aspects of organic chemistry with an emphasis on reaction mechanisms. It is intended to be an overview of aspects of physical organic chemistry. This course will not focus on memorizing organic reactions and mechanisms, but will concentrate instead on understanding how physical organic techniques are used to establish the mechanism of a reaction and to rationalize outcomes of organic reactions. Specific learning objectives will be listed on each of the weekly problem sets.

Learning Objectives:
1) Understand the principles of atomic structure and bonding as it applies to organic chemistry, especially the advantages and limitations of Huckel molecular orbital theory. Apply Huckel molecular orbital theory to understand organic structure and reactivity.

2) Gain familiarity with the traditional methods used to characterize reaction coordinates and activated complexes (mechanisms), including kinetic analysis, the Hammond Postulate, isotope effects, linear free energy relationships, and other methods.

3) Learn how catalysis of reactions is achieved (enzymatic and otherwise), with an emphasis on acid/base catalysis.

4) Apply the paradigm of reactivity where electrophile/nucloephile, Lewis acid/base, and donor/acceptor orbitals can be used to predict reactivity.

5) Understand the mechanism of substitution at aliphatic centers and thermal isomerizations and rearrangements. The "standard" electron-pushing description of the mechanism will be reviewed, as well as deviations from the mechanism due to variations in the structure of reactants and/or experimental conditions.

6) Understand pericyclic reaction mechanisms in terms of molecular orbitals

7) Learn a subset of photochemical reaction mechanisms.

Course Structure/Policies:
Class Schedule (see end of syllabus). While exam dates will not change from this schedule, I may periodically incorporate some current topics in organic chemistry, introduce applications of organic chemistry to other disciplines, or elaborate on topics as needed. Therefore, please use the syllabus as a *rough* guideline for the timing of topics.

Furlough Days. Due to budget cuts to the CSU by the state legislature, all academic year faculty (such as myself) are required to take up to 6 furlough days each quarter depending on grant support status. A furlough day is not a holiday -- it is mandatory un-paid time off. Furlough days are concrete examples of how massive state budget cuts have consequences for you as students and for me as a faculty member. Two of the days are mandated by the President: October 16 and November 20. The other two are distributed throughout the quarter: October 27 and November 9. One of those days will be a class day - you will still meet to work on an in-class exercise. (More details to follow).

Reading. You are expected to read (see schedule) BEFORE you come to class.

Homework. For this class, you will be assigned to be part of a small study group. (Many studies have shown the significant benefits of working in groups/cooperative learning. See, for example, Paulson, D.R. *J. Chem. Ed.* **1999**, *76*, 1136-1140. It is also known that one of the best ways to learn is by teaching others). Each group will submit one group answer for the assigned graded homework problems. The solution should be logical and

complete. All members of the group must sign the answer sheet, indicating that the answer was arrived at by group discussion. **If you did not participate in the group discussion on that problem set, then you may not sign the answer sheet**. Periodically, you will be given an opportunity to formally evaluate your own and your peers' contributions to these group discussions (see "participation" in grade breakdown, worth approximately one homework set).

The problem set will contain a brief list of learning objectives and a set of graded problems. Homework problem sets will be assigned approximately every other week, due one week later. Solutions will be available as files on the course website. The group homework scores will be normalized to the point value listed in the Grade Breakdown (100 points). For example, each homework set will be graded out of approximately 20 points, but the final homework grade will be determined by the following equation:
= [(HW1 grade + HW2 grade +…)/(Max homework point total)]*100

Quizzes, exams, final. There will be three quizzes (worth 25 points each; lowest score is dropped), two midterm exams, and a comprehensive final. You must do your own work on these quizzes, exams, and final. (Yet another reason to actively participate in your group homework sessions)!

Grade breakdown:

2 Exams	200 points
Final Exam	150 points
2 best of 3 Quizzes	50 points
Group Homework sets	100 points
	_____
	500 points

Grading will be based on an absolute grading scale, shown below. This means you are not competing against anyone in the class, and your grade is a result of your own efforts. *This also means that there is no "penalty" for working together in your study groups.*

This course will be graded +/-.

500-430	A
430-360	B
360-290	C
290-220	D
220-0 points	F

Class Schedule

	Topic/assignment	Required Reading
Sept 24	Organic Bonding Models - Huckel MO Theory; HW1 out	Carroll Ch. 4
Sept 29		
Oct 1		
	(HW1 due Oct 5)	
Oct 6	QUIZ 1; Tools of Physical Organic Chemistry	Anslyn Ch. 7, 8
Oct 8	HW 2 out	
Oct 13		
Oct 15		
	(HW2 due Oct 19)	
Oct 20	EXAM 1	
Oct 22	HW3 out; Catalysis	Anslyn Ch. 9
Oct 27	(McCurdy Furlough Day - Class still meets)	
Oct 29		
	(HW3 due Nov 2)	
Nov 3	QUIZ 2; Organic Mechanisms in detail	Anslyn Ch. 11
Nov 5	HW 4 out	
Nov 10		
Nov 12		
	(HW4 due Nov 16)	
Nov 17	EXAM 2	
Nov 19	Pericyclic Reactions HW5 out	Miller Ch. 2, 4
Nov 24		
Nov 26	NO CLASSES - University closed (HW 5 due Nov 30)	
Dec 1	QUIZ 3;	
Dec 3	Organic Photochemistry/Review	Carroll Ch. 10
Dec 8	FINAL EXAM, 1:30-4:00pm	

About Group Work
Group work is an integral part of this class. The driving force for using group work is the fact that any professional is part of a team; an engineer will not single-handedly design a bridge, but is part of a team. Also, working in groups will expose you to other ideas and perspectives to problem solving. You will get the most out this experience if you put in your effort: otherwise your team may build a "lemon" due to a lack of contribution of one or more members. If there is a problem in group dynamics, try to resolve it within the group (see below) before bringing the problem to the instructor's attention.

Grades in Group Work
The sum of all the group assignments will be scaled to be 100 points. You will also assess your group members' contributions to the group effort several times in the quarter on a scale of 0 to 5 (the **particpation grade**). These grades will be incorporated into your group homework grade.

Types of Group Work- suggestions
There are several roles that must be filled in the group. Only one copy of the solution is to be handed in, so a **recorder** is needed to write the answer on the answer sheet. A **moderator** or **discussion leader** will be important to maintain the focus of the discussions. If too much time is being spent on a problem unproductively, perhaps a separate **timekeeper** can be used to be sure that you don't spend too much time on any one problem before seeking help from your instructor, for example. In all cases, it is important that : all members' contributions be valued… all contributions are "group property" and are to be evaluated for their usefulness by the group as a whole… members' contributions and participation will be evaluated by the other group members at least once during the quarter… Some characteristics of an effective group are listed below.

a. **Members consider all seriously intended contributions**. People need to know the effect of their remarks/proposals/ideas to help them improve their group participation. Without feedback from other group members, the speaker cannot know whether the other members:

- did not understand the statement
- understood and either agreed or disagreed with it,
- understood the contribution, but thought it was irrelevant,
- and viewed the contribution as belonging to the group.

b. **Members check to make sure the understand what the speaker means before agreeing or disagreeing with the contribution**. Group members must paraphrase, check perceptions and their interpretations with the speaker to clarify the contribution before agreeing or disagreeing with it.

c. **Each member speaks only for him- or her self and lets the others speak for themselves.**

d. **All contributions are viewed as group "property" to be used or not used, by the whole group's decision.**

e. **All members participate, but in different and complementary ways.** Roles that are essential to the group are described above. It is important that these roles be rotated through the group so that each member can experience that responsibility.

Group Project: Participant Evaluation
For Homeworks 1 and 2

Group # SAMPLE ONLY- DO NOT FILL OUT!

Evaluation of Team-mates' Contributions (5 (best) → 1 (worst))

Complete this form in the *absence* of your group members.

Evaluate your group members in terms of their significant contributions to solving the problems. These criteria include their effort and participation, intellectual contributions (figuring out strategies), constructive comments and leadership in discussion. A score of 5 indicates high contributions whereas a score of 1 indicates near total apathy: that student is hoping that even though you did all the work for him/her you will still rate him/her highly.

An absent member gets 0 credit!

fold top section here to cover the ratings:

	contributions to the group effort (5 is best: ABS if absent)
Name	ABS 1 2 3 4 5
A:	
B:	
C:	
D: RATE YOURSELF:**WRITE YOUR NAME HERE**:	
E: (if you have 5 group members)	

Your signature: Date:

Please return today by dropping into my Department of Chemistry and Biochemistry mail box (Dr. Alison McCurdy) or on-campus mail by Friday.

fold here: