

CHEM*3750 ORGANIC CHEMISTRY II

Fall Semester, 2005

GENERAL INFORMATION AND COURSE OUTLINE

Instructor: Adrian L. Schwan, MacN 336 X58781

Office Hours: TBA

-and most any other time you find me in my office

-I will try to visit lab sections regularly

Required Materials

- (a) CHEM*3750 Organic Chemistry II Class Notes, Fall 2005 *edition* by A. L. Schwan
- (b) Text:
Organic Chemistry, 7th or 8th Edition and accompanying Study Guide
Graham Solomons and Craig Fryhle (henceforth shortened **SF7** (or **SF8**))
- (c) Laboratory Manual:
CHEM*3750 Organic Chemistry II Laboratory Manual
(notes + lab manual will be available in SCI 2109).
- (d) A molecular model set is often useful in “seeing” organic chemistry principles. The Bookstore sells one or maybe two types.

Method of Presentation There are two meetings each week (Tues., Thurs. 10:00-11:30 ANNU 156). The Tuesday slot will be solely lecture material following the Schwan notes and the sections indicated in **SF**. The Thursday slot will be both lecture time and tutorial time. This proposed allotment may occasionally be changed to accommodate scheduling.

Tutorial time will be used to:

- a) discussion of lecture material and how to write or understand mechanisms
- b) developing expertise and solving problems related to synthetic chemistry
- c) discussion of (assigned) problems
- d) material of your request and/or
- e) the laboratory.

As stated, the option is available to dedicate some tutorial time to new lecture material, depending on the pace of the throughout the term.

In CHEM*3750 we continue the organic chemistry education from CHEM*1040 and CHEM*2700. A knowledge of the reactions, mechanisms, terminology and concepts covered in those courses will be assumed and may be required as part of a satisfactory answer to examination questions. You should look over past course material and review any reactions as necessary as soon as possible.

Laboratory The CHEM*3750 laboratory consists of one three-hour period per week. There are 5 laboratory sections: Wednesday and Thursday at 2:30 - 5:20 pm and at 7:00-9:50 pm Science Complex 2nd floor. You will be checked in and briefed on the operation of the laboratory during your first scheduled laboratory period (Week of Sept. 12). You will also receive your first assignment, a library exercise, at that time.

Problem Assignments Several problem assignments (ca. 8-10) will be distributed during the term. They will consist of problems from **SF** and some generated by your instructor. Solutions to the Schwan problems will be made available about a week after the problem set is distributed. We should also have the opportunity to discuss some of them in the tutorial period, particularly upon your request. On one occasion, a number of problems from a problem set will be submitted for grading and that grade will contribute significantly to your final mark. In that instance, a due date and time will be set (i.e., the beginning of a class) for submission of your solutions.

Course Grade The final grade will be calculated as follows:

Item	Value	Comments
Problem Questions	12%	1 st submission: Ch. 1, spectroscopy
Small class test	8%	In class on Tues. Oct. 25/05 (covers part of Chapter 2)
Large class test	15%	In class on Thurs. Nov. 17/05 (covers at least Chapters 2 and 3)
Final examination	35%	Cumulative; During exam period
Laboratory	30%	See last page of this outline for Lab grade detail and breakdown.

YOU WILL NOT PASS THE COURSE UNLESS YOU HAVE RECEIVED A PASSING GRADE ON AT LEAST ONE OF: A) THE PROBLEM QUESTIONS (12%); THE SUM OF THE CLASS TESTS (22%); OR THE FINAL EXAM (35%)

ONLY VALID EXCUSES ON MEDICAL OR COMPASSIONATE GROUNDS WILL PREVENT A GRADE OF ZERO FOR ANY MISSED LAB, ASSIGNMENT OR EXAMINATION (SEE CALENDAR SECT. VIII). STUDENTS MAY BE ASKED TO PROVIDE CERTIFICATION OF ILLNESS. CPES POLICY PREVENTS CHANGES TO THE GRADING SCHEME FOR INDIVIDUAL STUDENTS, EXCEPT IN CASE OF ILLNESS. MIDTERM PAPERS MAY BE RETURNED TO THE INSTRUCTOR FOR CORRECTION OF GRADING ERRORS, ONLY WITHIN ONE WEEK OF THE RETURN OF THE GRADED PAPERS. NO ADDITIONS MUST BE MADE AFTER RETURN OF THE PAPER. THE INSTRUCTOR MAY REFUSE TO REGRADE A PAPER, AT HIS DISCRETION. THE USE OF STORED PROGRAMS OR STORED ALPHANUMERIC INFORMATION ON CALCULATORS, DURING EXAMINATIONS OR TESTS, IS NOT ALLOWED.

Course Outline

1 - INTRODUCTION TO ORGANIC SPECTROSCOPY

1. ^1H NMR Spectroscopy
2. ^{13}C NMR Spectroscopy
3. Infrared (IR) Spectroscopy
4. Other Spectroscopic Methods

2 - ALDEHYDES AND KETONES

1. Synthetic Routes to Aldehydes and Ketones
2. Acidity and Enolization of Aldehydes and Ketones
3. Halogenation of Ketones and Aldehydes
 - haloform reaction
4. Alkylation Reactions and Enamines
5. The Aldol Condensation
6. Other Related Condensation Reactions
 - Claisen, Dieckmann, Reformatsky condensations
7. Synthetic Applications of Condensation Reactions
 - acetoacetate synthesis
 - malonate synthesis
 - Robinson annelation
8. The Wittig Olefination of Aldehydes and Ketones
9. Reductive Conversion of $\text{C}=\text{O}$ to CH_2

3 - CONJUGATION

1. Terminology and Nomenclature
2. Allyl
3. Conjugated Dienes
4. The Diels Alder Reaction
5. Molecular Orbital Description Of Conjugation

4 - BENZENE: AROMATICITY, CONJUGATION AND ASSOCIATED REACTIVITY

1. Aromaticity
 - $(4n + 2)$ rule, resonance energy
2. NMR Spectra of Benzene Derivatives
3. Side Chain Chemistry of Benzene Derivatives
 - radical bromination
4. Birch Reduction (The destruction of aromaticity)

5 - REACTIVITY OF SOME SUBSTITUTED AROMATIC COMPOUNDS

1. Aromatic Amines
2. Diazonium Salts
 - Sandmeyer reaction
3. CHEM*2700 and aromatic synthetic strategies.
4. Aryl Halides
 - nucleophilic aromatic substitution
 - benzyne
5. Phenols and Phenyl Ethers

6 - SYNTHESIS

As part of lecture or tutorial sessions, some synthetic strategies will be presented that comprise an effort to tie together the various chapters of this course and of CHEM*2700.

HELPFUL WEBSITES

Assistance with organic chemistry

<http://www.abdn.ac.uk/chemistry/org/intro.hti>

http://chemed.chem.purdue.edu/~genchem/topicreview/bp/3organic/3org_frame.html

http://ep.llnl.gov/msds/orgchem/rxn_mech.html

http://chemed.chem.purdue.edu/~genchem/topicreview/bp/2organic/2org_frame.html

<http://www.colby.edu/chemistry/OChem/webcards.html>

<http://homework.chem.uic.edu/NEXT.HTM#>

<http://c4.cabrillo.cc.ca.us>

Database of spectra

<http://www.aist.go.jp/RIODB/SDBS/menu-e.html>

Spectral help

<http://chipo.chem.uic.edu/web1/ocol/spec/>

Solomons and Fryhle

<http://www.wiley.com/college/chem/solomons190950/>

Molecule Drawing Software

<http://www.acdlabs.com/download/>

-look for the “ChemSketch 4.5 Freeware”

Reference Books on Reserve

Lecture Material

Organic Chemistry, 6th ed. T.W.G. Solomons QD253.S65 1996 (or QD 251.2.S66) (2 copies)

- written for students
- good colour in diagrams

Organic Chemistry, 2nd ed. K.P.C. Vollhardt QD251.2.V65 1987

- good text

Introduction to Organic Chemistry, 4th ed. A. Streitwieser, C.H. Heathcock, C.H., E.M. Kosower QD251.2.S76 1992

- good text
- slightly higher level

Principles of Organic Synthesis R. O. C. Norman QD262 N6.

- good reference for undergraduate organic principles and synthesis

Organic Chemistry, 3rd ed. Brown and Foote

Organic Chemistry, 4th ed. F.A. Carey QD251.2.C364 2000

Organic Chemistry, 5th ed. J. McMurry QD251.2.M43 1999

Lab Material

Experimental Organic Chemistry L.M. Harwood & C.J. Moody QD261.H265 1989

Microscale Organic Laboratory 3rd ed. D.W. Mayo, R.M. Pike, P.K. Trumper
QD261.M38 1994

Operational Organic Chemistry, A Laboratory Course J.W. Lehman QD261.L39

Introduction to Organic Laboratory Techniques, A Contemporary Approach D.L. Pavia,
G.M. Lampman, G.S. Kriz, R.G. Engel QD261.P38 1988

Laboratory Details

Be sure you read the introductory sections of the lab manual thoroughly before you attend your lab section. Moreover, before you attend a particular practical lab, it would be useful if you were to prepare a flowchart for yourself outlining the lab procedure.

Your lab grade will be comprised of 3 contributions:

For 6/30 marks you will be graded on your practical skills and wherewithal as judged by your T.A.

For 12/30 marks, your lab book will be marked, for completeness and proper usage. Your minor reports that are to go directly in the lab book will also be graded to be part of this mark. Your TA will provide more details.

For 12/30 marks, you will write a formal report based on Experiment #5 according to a) the outline presented near the front of your lab manual and b) additional comments from your T.A. and submit it for grading. The report will be marked out of 100 and the mark will be scaled to 12. If upon seeing that graded report, you are dissatisfied with your mark, you may submit a re-write of that report. If you adopt this scenario, your grade will be obtained as follows: (original grade scaled to 4%) + (grade from re-write scaled to 8%) = 12% (ie, 12 final marks)

The formal report on Experiment 5(Dimedone Preparation) is due in your laboratory period during the week of Oct. 31/05. Your report may be submitted to your T.A. but may also be given to Prof. Schwan or to a chemistry secretary who will date the document upon your submission. Late marks of 2% per school day will be assessed if this deadline is not met. The re-written report will be due on or before Nov. 24/05 and will not be accepted late. You must inform your T.A. within 1 week after seeing your original grade if you plan to submit a re-written report.

Major reports will not be returned at the end of the semester, although your grade form will be and you will have the opportunity to discuss your grade with your T.A. Lab books also **WILL NOT BE RETURNED.**