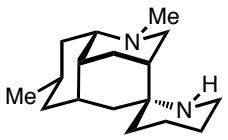

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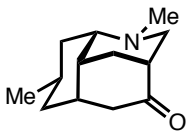

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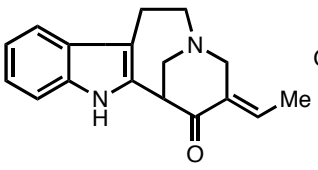
Organic Chemistry
Chemistry 142
Spring 2013



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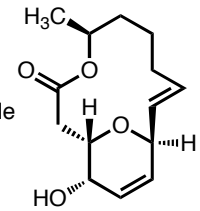

aspergillide C
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Instructor: Stephen P. Waters; Office: Cook A321; email: Stephen.Waters@uvm.edu
BlackBoard Site: bb.uvm.edu
Lecture: 4:05 pm – 5:20 pm MW, Angell B106
Recitations: 5:30 pm Thursday, Fleming Museum, Room 101
UVM Holidays: Classes will not be held on January 21st, February 18th, March 4th-8th
Laboratory Starts Week of Jan 28th – Jan 31st

Required Text and Course Materials:
Organic Chemistry, Klein, 1st ed., Wiley (required)

Chem. 142 Laboratory Manual (available from 1st floor stockroom, Cook A143)

Bound lab notebook with numbered pages (can continue to use that purchased for 141).

Safety glasses (available in the UVM Bookstore)

Recommended Text and Course Materials:
Organic Chemistry, Study guide by same author (strongly recommended)

Molecular Structure Models (e.g.: ISBN: 0471-362719)

Organic Chemistry I as a Second Language: Translating the Basic Concepts, D. Klein

Organic Chemistry II as a Second Language: Second Semester Topics, D. Klein

Books in library that you may find useful:
The Art of Writing Reasonable Organic Reaction Mechanisms R.B. Grossman; ISBN:0-387-95468-6

Writing Reaction Mechanisms in Organic Chemistry A. Miller; ISBN: 0-12-496711-6

Course Prerequisite: Chemistry 141 or 143.

Office hours: Monday 11:00 –12:00
Thursday 3:00 – 4:00

TA Office hours are arranged according to lab section. If you can't attend office hours, or you need to see the instructor or TAs outside office hours, make an appointment.

Religious Holidays: Students have the right to practice the religion of their choice. Each semester students should submit in writing to their instructors by the end of the second full week of classes their documented religious holiday schedule for the semester. Faculty must permit students who miss work for the purpose of religious observance to make up this work.

General Comments

In Chemistry 142 we continue to explore the basic principles of Organic Chemistry with a greater emphasis on the chemical reactivity of various functional groups (i.e. more similar to the last 1/3 of the first semester course). You will also learn about the analytical instrumentation used on a daily basis by chemists to determine the structure and composition of organic molecules.

By now you have probably noticed that Organic Chemistry involves many new concepts and a very large number of reaction mechanisms. However, as the course progresses and your organic "intuition" develops, you will discover that a relatively small subset of first principles nicely tie together the seemingly vast amount of information contained in the text. A special effort made at the beginning of the course to review and master important concepts from the first semester will pay off as the course progresses. Topics that are especially important to review include:

Arrow Pushing: Arrow pushing may be the most important tactic of organic chemistry because it allows you to show a pictorial representation of a reaction mechanism. When done properly, arrow pushing will allow you to keep track of the bonds that are made and broken throughout the course of a reaction, as well as keep track of any formal charges that develop. Having a good grasp of arrow pushing will make learning the large number of reactions you will see in this course easier, because you will then understand the underlying mechanism of the reaction rather than trying to memorize it as a "fact". ***I can't overemphasize the importance of having a good working knowledge of arrow pushing.*** Be forewarned that arrow pushing will be used on a daily basis in class and you will be expected to write mechanisms using correct arrow pushing on exams.

Resonance: This is a very important concept and you have already seen that resonance can help rationalize why carboxylic acids are acidic and alcohols are not. You will see resonance used over an over again to rationalize why molecules react the way they do, and a good understanding of the rules for writing proper contributing "structures" to resonance hybrids will make the understanding of reaction mechanisms considerably easier. In order to have a good understanding of resonance you must also have a good grasp of electronegativity and arrow pushing.

Electronegativity: An understanding of the relative electronegativity of atoms is essential to understanding why molecules react the way they do. For example, the concept of electronegativity allows you to rationalize why some atoms are good leaving groups and others are not.

Chemical Reactions: You will be expected to know all the chemical reactions you covered in Chem. 141.

Nomenclature: Particularly, the names of all the functional groups as well as the standard IUPAC rules for naming simple organic compounds. If you don't know the functional groups, you will not be able to follow the discussion in class.

Stereochemistry: Determining *R*/*S* designations as well as *E*/*Z*. Understanding the difference between different types of stereoisomers (enantiomers/diastereomers) and being able to correctly identify the stereochemical relationship between compounds (i.e. are they diastereomers, enantiomers, constitutional isomers, different molecules, etc.).

Keys to success in Organic Chemistry:

- Do not try to cram!
- Work as many practice problems as possible. Practice problems reinforce the new concepts and are the only way to test your understanding of the material.
- You will see many new concepts in this course. Try to write out an explanation of the concepts in your own words as if explaining them to someone else.
- Do not look at a problem's answer until you have really tried the problem. After seeing the answer it often seems obvious and you may assume you understand.
- When you get a problem wrong, try to understand where your thinking was in error and attempt to identify what concept you missed.
- Ask questions!
- Come to review sessions, office hours or make an appointment with me or your T.A. to resolve any questions early!
- Review the material frequently.
- Many people find that flash cards are a good way to learn this material.

For each chapter you should work as many of the suggested problems as possible. I strongly urge you to keep up with your reading and problem solving. Learning organic chemistry takes a combination of patience, practice, and repetition. Cramming does not work well in this subject!

Academic Conduct: Cheating will be considered grounds for failing the course. All graded assignments must be your own work. Cases of cheating or plagiarism *will* lead to further disciplinary action which may include dismissal from the University according to the rules set forth in The University of Vermont's *Code of Academic Integrity*.

Policy of Electronic Device Usage on Exams: In short, you can't use them! The use of any electronic device (calculator, cell phone, ipod, or anything else with batteries or a solar cell) is strictly forbidden on exams and will be considered cheating.

Grading: 3 Midterm exams (60%, 20% each); Cumulative final (20%); Lab grade (20%)

No exam grades are dropped. However, if you do better on either the ACS standardized exam or the final exam than your lowest midterm exam grade, I will drop your lowest midterm exam grade and count the higher of these exams twice. No exams will be curved. The only valid excuses for missing an exam are medical or other true emergency situations. If you miss an exam for such a reason, you must inform me of it promptly, present appropriate documentation of your excuse, and receive formal approval to take a make up exam. If you miss an exam for any other reason, you will receive a grade of zero for that exam. There will be only one make-up exam given during the semester; it will be scheduled at the end of the semester, and it will be cumulative.

However, please note: *You must earn a passing grade in the laboratory to receive a passing grade for the course. More than two laboratories missed for any reason will result in a failing grade for the course (unless granted an incomplete by your Dean).*

Exam Re-grades: If you have any questions concerning the grading of an exam, you must see me within one week after the day the exam is returned to the class. Exams must be taken in ink to insure that you can get points for a grading error.

Midterm Dates:

Thursday, February 21st	5:30 P.M.-7:30 P.M.
Thursday, March 21st	5:30 P.M.-7:30 P.M.
Thursday, April 18th	5:30 P.M.-7:30 P.M.

Where to take your midterm exams: Due to class size, the midterms will be held in two separate rooms as follows:

Last Names **A–H** will take exams in **Lafeyette Room L108**
Last Names **I–Z** will take exams in **Fleming Museum Room 101**

Final Exam Date:
Friday, May 10th 1:30 P.M. – 4:15 P.M. Place: **Angell B106**

Multiple Choice, Alternate ACS Standardized Final: Lab Week of April 22nd – 25th

One goal of our department is to access student learning in our courses by gathering data that indicates how much a student has learned in a given subject. To do this in a scientific way, a cumulative, standardized 70 multiple-choice question exam will be administered during the final week of lab. The exam covers concepts from both CHEM 141 and 142.

This exam is optional and is given as an alternative to my normal final exam. If you choose to take this exam, you have the choice of using the grade you receive on this exam as your final exam grade (i.e.; you do not need to take the normal final exam). However, if you take this exam and you are not satisfied with the grade you receive on this exam (raw, un-normalized score), you are still welcome to take the normal final exam. If you take both exams, only the higher exam score will be used as your final exam score. You will be informed of your score on this exam well in advance of the normal final.

This course will address learning goals 1,2,3, and 5 below for chemistry majors:

1. Students will demonstrate general knowledge in chemistry and will be able to apply chemical and physical principles in the solution of qualitative and quantitative chemical problems.
2. Students will understand the interplay of observational data, hypotheses, and hypothesis-driven experimentation through application of the scientific method.
3. Students will become proficient in chemical laboratory techniques and be able to apply these to practical and current problems in research.
4. Students will be able to read and critically evaluate the scientific literature.
5. Students will learn to present scientific data clearly and effectively through both written and verbal communication.

Tentative Outline of Course

Chapter 15. Infrared Spectroscopy and Mass Spectrometry
All Sections except 15.13–15.15

Chapter 16. Using Nuclear Magnetic Resonance Spectroscopy to Deduce Structure
All Sections except 16.13

Chapter 13. Alcohols
Sections 13.2–13.4; 13.6; 13.9–13.10

Chapter 14. Ethers and Epoxides (very brief!)
Sections 14.1; 14.3; 14.5; 14.8; 14.10; 14.12

Chapter 17. Conjugated Pi Systems and the Diels–Alder Reaction
Sections 17.1; 17.2; 17.4; 17.7

Chapter 18. Aromatic Compounds
Sections: 18.1–18.3; selected portions of 18.4 and 18.5, 18.6

Chapter 19. Aromatic Substitution Reactions
All Sections except 19.13–19.15

Chapter 20. Aldehydes and Ketones
All Sections except 20.2; 20.8; and 20.13

Chapter 21. Carboxylic Acids and Their Derivatives
All Sections except 20.15

Chapter 22. Alpha Carbon Chemistry: Enols and Enolates
Sections 22.1–22.4, selected portions of 22.5 and 22.6

Time Permitting: Chapter 23. Amines
Sections 23.1; 23.3–23.7

Thursday Evening Recitations:
Each week I will email some suggested problems to be discussed at the following Thursday Evening Recitation. This is a perfect opportunity to practice problems and work through some of the tricky points in regards to the new concepts. The questions are not graded but many students find these recitation sessions to be very helpful.

Concepts you must understand from General Chemistry:

- Properties of covalent bonds
- The octet rule
- Structural isomers
- Lewis dot structures
- Formal charges
- Resonance
- Electronegativity and bond polarity
- VSEPR (Valence Shell Electron Pair Repulsion)
- Hybridization

CHEM 142 Lab Schedule – Spring 2013

Date	Expt #	Title	Page
1/28-1/31	1	Synthesis of Alkyne: Addition-Elimination	9
2/4-2/7	2	Diels-Alder Cycloaddition	12
2/11-2/14	3	Nitration of Methyl Benzoate	15
2/18-2/21		NO LAB/PRESIDENT'S DAY HOLIDAY	
2/25-2/28	4	Generation and Reaction of an Organometallic Compound Part 1	18
3/4-3/7		NO LAB/ SPRING RECESS	
3/11-3/14	5	Generation and Reaction of an Organometallic Compound Part 2	18
3/18-3/21	6	The Wittig Reaction	21
3/25-3/28	7	Solventless Aldol	24
4/1-4/4	8	Production of Biodiesel	26
4/8-4/11	9	Synthesis of Aspirin	28
4/15-4/18		CHECKOUT	
4/22-4/25		STANDARDIZED EXAM	

On-line resources that may be useful to you

http://bcs.whfreeman.com/organic6e
Publisher's website has:
Online quizzes
Animated Reaction Mechanisms
Animated Orbital Images
Nomenclature Exercises
Videos of lectures given by author of our textbook

http://www.aceorganicchem.com/resources.html
"Organic Chemistry Best of the Web 2010" – compilation of websites

http://www.chemtube3d.com/Main%20Page.html
High quality videos of organic reaction mechanisms.

http://ochem.jsd.claremont.edu/intro.htm
On-line flash cards
Video Tutorials
Practice Problems