Organic Chemistry for Majors 1
Chemistry 1500

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Pronouns: he/him
BlackBoard Site: bb.uvm.edu
Lecture: MWF 10:50-11:40 am in Innovation E430
Office Hours: Monday/Wednesday/Friday 9:30-10:30am, or by appointment (via Zoom)

Required Course Materials

- Organic Chemistry 7th ed., Loudon and Parise, Roberts and Co., 2021 (ISBN: 978- 1319363772)
- Organic Chemistry Study Guide and Solutions Manual 7th ed., Loudon and Parise, Roberts and Co., 2021 (ISBN: 978-1319335915)
- Techniques and Experiments for Organic Chemistry" 6th Ed., Ault, "University Science Books, 1998. Purchase or Rent from: University Science Books: http://www.uscibooks.com/

Recommended Course Materials

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

Books in the Howe library that may be useful:

- Organic Chemistry I as a Second Language: Translating the Basic Concepts 2nd ed., D. Klein; ISBN: (978-0470-12929-6)
- Organic Chemistry II as a Second Language: Second Semester Topics 2nd ed., D. Klein; ISBN: (978-0-471-73808-4)
- 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 Prerequisites: Chem 31/32 or solid high school chemistry experience (AP or Honors).

This course will address learning goals 1, 2, 3, and 5 below for chemistry and Biochemistry 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 chemical and scientific literature.
5. The students will learn to present scientific data clearly and effectively through both written and verbal communication.

General Course Comments

In Chemistry 1500 we begin an exploration of the basic principles of Organic Chemistry. You will find that Organic Chemistry involves many new concepts, a large number of rules and (by the end of the second semester) a large number of reaction mechanisms. However, as the course progresses and your knowledge grows, you will find that a relatively small subset of concepts tie together the vast amount of information contained in the text. Learning these underlying principles and knowing when and how to apply them to solve problems is the key to success. You have seen many of these concepts in General Chemistry, but here they will be considered from a different point of view. For example, knowing the relative electronegativity of atoms is essential to understanding why molecules react the way they do – electronegativity allows you to rationalize why some atoms are good leaving groups and others are not. *A special effort made at the beginning of the course to learn how to write proper structures with the correct number of bonds, formal charges, and unshared pairs of electrons is important. Knowing the relative electronegativity of atoms, knowing Lewis acid-base theory, Bronstead-Lowry acid-base theory, and the rules for writing proper contributing "structures" to resonance hybrids will make understanding reaction mechanisms considerably easier.*

Organic Chemistry is not inherently difficult, but it is different than any chemistry you have seen so far. Although the lecture only meets for 3 hours a week, you will need to do a substantial amount of work outside of class (figure at least 2 to 3 hours per lecture) to learn and practice the material. I strongly urge you to keep up with reading the textbook outside of class and work as many of the suggested problems as possible –you will need to learn new concepts and then apply those concepts in new situations, which will take a slow and steady approach…*cramming does not work well in this subject*! Understanding the material and being able to apply that understanding to solve problems are two different things! Problem solving is the best way to learn this material!

Key Concepts:

Arrow Pushing: Arrow pushing is one of the most important "tools" 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 **electrons** as bonds 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 more acidic than alcohols. You will see resonance used over and 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: Knowledge of the relative electronegativities 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 we covered in Chem. 47.
Nomenclature: I will assume you know 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. In my view, it is more important that you be able to draw a structure from a given name than write a name for a given structure.

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

- Do not try to cram!
- **Work as many practice problems as possible.** Practice problem reinforce the new concepts and are the only way to test your understanding of the material. There are many organic chemistry textbooks in the library and they all cover similar material. Work problems in other books once you have finished the problems in our book.
- 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.
- 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.
- Ask questions! Come to 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*.

> **NOTE:** You may discuss take home quizzes and sapling assignments with your peers and use these as group study aids. However, these exercises are *learning opportunities* and should be used as such. If you just blindly copy your friend's work you *will not* get anything from the exercise, which will become painfully clear to you on the exam!

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: Your course grade will be based on on-line homework assignments, three examinations, a cumulative final examination, and your laboratory grade. (**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 you are granted an incomplete by your Dean).

- Lab 20%
- Quizzes 20%
- 3 Midterm Exams 40%
- Cumulative Final 20%

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.

Midterm Exams will be given during the Chem. 1410 Lab slots in Discov. W211, which meet:
Thursdays from 1:15 - 5:15. The exams will be held on:

- Sept 28th
- Oct 26th
- Nov 30th

If you have a conflict with this timeslot, you are required to reschedule your exam ONE WEEK prior to the scheduled exam.

Final Exam Date and Location: Tuesday, Dec 12th, 1:30 – 4:15 in Innovation E430

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.