

Advanced Organic Chemistry II
CHEM 3202
Winter 2020
Prospectus

(last updated: January 7, 2020)

*****PRELIMINARY VERSION*****

Who (Instructor): Prof. Dr. Jeff Manthorpe, Office: 419 Steacie Building; Research Lab: 403 Steacie
Email: jeff.manthorpe@carleton.ca

When and Where: Classes: Tuesdays and Thursdays, 8:35 to 9:55 a.m., Tory 431
Tutorials: Wednesdays, 8:35 to 9:55 a.m., Tory 431
Office Hours: To be determined. I also have an open door policy for my office. Just come by and knock or send an email to make an appointment.

cuLearn: cuLearn will be used to distribute notices regarding the class. Please check it regularly. Any students who do not have access to cuLearn should speak to me ASAP to make alternate arrangements to receive class notices and handouts.

What:

*This course builds on and expands on many concepts and topics that were introduced in Organic Chemistry I and II therefore you **NEED** to review **ALL** of your notes from Organic Chemistry I and II **NOW** and review specific topics as we start to study them this term. There are also several new, but related concepts and topics introduced.*

Resources if you need to review old material:

1. Second-year notes
2. Search for the topic at www.masterorganicchemistry.com
3. Check the textbook for this course
4. Try common textbooks used for second-year organic chemistry (I'll post a list on cuLearn)

Course Learning Objectives:

To develop or further develop student understanding and appreciation of:

1. Reaction mechanisms, including electrophilic and nucleophilic sites in organic molecules
2. Reaction coordinate diagrams
3. Hard-Soft Acid-Base (HSAB) principle
4. Principle of stability vs. reactivity
5. Acids and bases in organic chemistry
6. Oxidation states in organic chemistry
7. Molecular orbital theory in organic chemistry
8. Addition reactions versus Substitution reactions
 - a) Nucleophilic addition to C=O bonds (aldehydes and ketones)
 - b) Nucleophilic substitution at carbonyl systems (see 9c-9h)
 - c) Nucleophilic addition to the alkene of α,β -unsaturated carbonyl systems/Conjugate addition
 - d) Electrophilic addition to alkenes
 - e) Electrophilic aromatic substitution
 - f) Nucleophilic aromatic substitution (S_NAr)
 - g) Unimolecular nucleophilic substitution (S_N1)
 - h) Bimolecular nucleophilic substitution (S_N2)

9. The chemistry of carbonyl systems and pseudo-carbonyl systems (e.g. i, j):
 - a. Aldehydes
 - b. Ketones
 - c. Esters
 - d. Thioesters
 - e. Amides
 - f. Carboxylic acids
 - g. Carboxylic acid anhydrides
 - h. Carboxylic acid chlorides
 - i. Cyanides
 - j. Nitroalkanes
10. The chemistry of alkenes
11. The chemistry of aromatic rings, including heterocycles
12. The chemistry of conjugated π systems:
 - a) α,β -unsaturated carbonyl systems
 - b) conjugated dienes
13. The chemistry of radicals
14. The relationship between organic chemistry and biochemical processes
15. Stereochemistry
16. The organic chemistry literature

Topics Scheduled to be Covered (in an approximate order):

Review	2203 and 2204, the basics of mechanisms
Chapter 8	Acidity, basicity, and pK_a
Chapter 23	Chemoselectivity: selective reactions (Oxidation and Reduction) and protection
Chapter 9	Using organometallics to make C-C bonds
Chapter 15	Nucleophilic substitution at saturated carbon (S_N1 and S_N2)
Chapter 21	Formation and reaction of enols and enolates
Chapter 22	Conjugate addition
Chapter 26	Alkylation of enolates
Chapter 27	The aldol reaction
Chapter 29	Conjugate addition of enolates
Chapt. 35, 36	Pericyclic reactions
Chapter 37	Radical reactions
Chapt. 29,30	Aromatic and heterocyclic chemistry

Evaluation:

Midterm Examination I	10%	You are allowed to drop your grade from up to ONE midterm exam if it will result in a higher final grade. The weight of the dropped midterm examination will be added to the value of your final examination. Similarly, if you are unable to attend a midterm examination for any reason (documented illness, etc.), the weight of that midterm exam will be added to your final exam.
Midterm Examination II	17%	
Midterm Examination III	24%	
Assignments	10%	
Participation in class	5%	
<u>Final Examination</u>	<u>34%</u>	
Final Grade	100%	

Important Dates (Dates may be changed, if required):

January 9: First class	February 26: Midterm II
January 9: First tutorial	March 16: Midterm Exam III
February 3: Midterm Exam I	April 1: Final tutorial
February 16 to 24: Winter Break	April 7: Final class

DATE, TIME, and LOCATION of the FINAL EXAM will be determined at a later date by the University. The examination will be three hours in duration and will cover all of the course material (*i.e.* the exam will be cumulative).

Midterm Examinations: Midterm examinations will possibly be scheduled in the evening, outside of class time (approximately 6:00 p.m.) or conducted in class. All exams will be cumulative. All students are recommended to write all the midterm exams; however, you may opt not to write up to two of them (*i.e.* you must write at least one). If you miss a midterm exam you do not need to provide a note unless you did not write the first two and had a legitimate reason for missing the third.

Assignments: There will be at least 3 assignments spread throughout the term, usually in preparation for an exam.

Lecture and Tutorial Formats: Wednesday and Thursday classes will generally be used to present lecture material for the week. Students will then have until class the following Tuesday to watch the video content and/or read the textbook to cover the remaining material for the week. The Tuesday class will be the tutorial/problem-solving session for the previous week's material.

Lecture material will be presented (both in videos and in class) in a combination of electronic slides and writing on the slides via a tablet or traditional chalkboard delivery. Slides will be available on cuLearn the day before class or earlier. Students are expected to print the slides and bring them to class or bring a tablet computer. An effort will be made to leave appropriately sized gaps in the slides so that additional material may be written in the appropriate place. Students are also expected to have some extra paper handy.

Textbook:

1) **Organic Chemistry (2nd edition)** by Clayden, Greeves, Warren and Wothers; Oxford University Press, 2012. ISBN: 0-19-850346-6 and **Solutions Manual to Organic Chemistry (2nd edition)** by Clayden, Greeves, Warren and Wothers; Oxford University Press, 2013. ISBN: 0-19-966334-3 (**Required**) from Haven Books (located at corner of Sunnyside and Seneca, <http://www.havenbooks.ca/>). Sold as a bundle for \$132.15. The textbook alone regularly sells for \$129.95 and the solutions manual is \$69.95 so by bundling them together you get the solutions manual for \$2.20! Yeah, I know it's pretty sweet! You're welcome. *NOTE: Those are the 2018 prices. They may have changed for 2019.*

2) **Molecular Visions Model Kit (Highly Recommended)** These molecular model kits are an excellent balance of affordability and accuracy. They are available online at <http://www.molecularvisions.com/> (kit #1) or from the bookstore. They are also useful for organometallic and inorganic chemistry – money well spent!

Prerequisites: CHEM 3201.

Problems from the Textbook: Problems associated with each chapter will be assigned by the instructor and will be drawn from the course textbook and other sources. Solutions to the problems from the course textbook (which are actually on the web, not in the book – it was another cost-saving measure to keep the book shorter) can be found in the Solutions Manual listed above. It is the responsibility of the student to do these problems. They will not be handed in for grading. However, students are free (and encouraged) to ask questions of the instructor about the problems.

Paul Menton Centre Registrants: Students registered with the Paul Menton Centre for Students with Disabilities be adequately accommodated. However, PMC students are hereby notified that in order to receive accommodation, they must present the appropriate paperwork to the instructor ***NO LATER THAN ONE WEEK IN ADVANCE***.

Academic Misconduct: The consequences of copying, plagiarism, and other forms of cheating are substantial. Students are referred to Section 14 of the Course Calendar for information on this topic. The Carleton University Academic Integrity Policy can be found online at <http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/acadregsuniv14/>. It is **YOUR RESPONSIBILITY** to know the contents of these policies so it is highly recommended that you read them.

WHMIS Training: While not specifically required for this course, you are **REQUIRED** to have done WHMIS training **WITHIN THE LAST YEAR** if you are taking any labs or working in a research lab. See any of your lab coordinators to obtain the instructions for the online training course, which takes about 2 hours.

EXPECTATIONS AND RESPONSIBILITIES

It is my responsibility, as the instructor, to:

- show up for class on time and ready to teach well and be prepared to answer questions
- teach in a stimulating and engaging way
- make myself available to students outside of class hours to a *reasonable* extent to answer questions
- evaluate students in as fair a manner as possible by providing frequent feedback about performance and testing on knowledge of material actually included in the course content
- treat students with respect and foster a healthy intellectual environment in and out of the classroom
- respond to emails by the end of the next school day (*i.e.* emails received on Friday, Saturday, or Sunday will be responded to by the end of the day on the following Monday)
- make a sincere effort to have grading completed and the grades posted on cuLearn within one week

It is your responsibility, as a student, to:

- show up for class on time, ready to learn and be prepared to participate in class
- bring your lecture notes for the day's class
- not disrupt the class. Please remember to *turn off your phone*. ☺
- devote an appropriate amount of time outside of class to studying, doing the assigned reading and problems from the textbook
- attending all examinations unless health or personal reasons intervene

As a student, you are requested to:

- provide (anonymous) feedback to the instructor about their performance throughout the term, not just at the end. You can anonymously print out or write comments and/or constructive criticism and put them in my departmental mailbox in 203 Steacie.

Tips for Success in this Course:

- Take 10 minutes before class and look over the notes for the day
- Spend 10 minutes after class to review the day's notes
- Set aside 2 hours a week to read the chapters from the textbook
- Set aside 2 hours a week to do the problems from the textbook
- ASK QUESTIONS

Course Outline (Syllabus) Information on Academic Accommodations

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline