

Organic Chemistry 1 - CHEM 2203/2207

Fall 2021

Instructor: Dave Brock

All dates and times referenced in this course pertain to local time at Carleton University. This corresponds to Eastern Standard Time (EST) with Daylight Savings Time applied on the appropriate dates.

Labs will be carried out either fully electronically, or as a mix of in-person and electronically as you have signed up for the course. Tests and examinations in this course may be conducted using a remote video conferencing platform (e.g. Zoom) and/or a remote proctoring service (e.g. COMAS). Therefore, completion of this course will require you to have a device that meets the requirements at: <https://carleton.ca/its/help-centre/faq-technical-specs-for-new-students/> as well as a webcam, microphone, printer, and a scanner/camera capable of capturing and submitting written work electronically. By taking this course, you are consenting to the use of this software and to be monitored during tests and examinations. Furthermore, you are declaring that you have a reliable internet connection with sufficient capacity to support video proctoring.

Lectures

Lectures are live online (via Zoom) on Monday and Wednesday from 11:35am to 12:55pm. You are encouraged to participate – These class times will be used to work on problem solving skills, answer Clicker questions, show connections and applications of the content to the real world, perform chemical demonstrations as well as carrying out topic discussions. Barring any technical issues, the tutorials are also recorded and can be played back at any time.

Textbook

The text for the course is "Organic Chemistry" 4th Edition by David Klein published by Wiley.

The book is available from Carleton's bookstore, bundled with a two-term access code to WileyPlus, a homework management system you will be using.

This is the recommended package to buy.

If you buy a used book, or a discounted book elsewhere which does not include an access code, you can then buy access to WileyPlus alone at www.WileyPlus.com. Doing this gives you access to an electronic version of the book instead.

2203 Grading

Component	Notes	#1	#2	#3	#4	#5	#6	#7	#8
WileyPlus	6 Online Homework Assignments	5	--	5	--	5	--	5	--
Reef Polling	Lecture concept polls	5	5	--	--	5	5	--	--
Laboratory	Five experiments	30	30	30	30	30	30	30	30
Midterm	2 hours	25	25	25	25	12.5	12.5	12.5	12.5
Final Exam	3 hours	35	40	40	45	47.5	52.5	52.5	57.5

2207 Grading

Component	Notes	#1	#2	#3	#4	#5	#6	#7	#8
WileyPlus	6 Online Homework Assignments	5	--	5	--	5	--	5	--
Reef Polling	Lecture concept polls	5	5	--	--	5	5	--	--
Midterm	2 hours	35	35	35	35	17.5	17.5	17.5	17.5
Final Exam	3 hours	55	60	60	65	72.5	77.5	77.5	82.5

Grades for each component of the course will be released only via Brightspace.

To obtain credit for the course, all three requirements below must be met:

1. Obtain a minimum of 50% on the overall course grade, as calculated above using the method that gives the highest grade.
2. For Chem 2203, all laboratory experiments MUST be completed and all lab reports and all lab assignments MUST be submitted.

Students who fail to meet the above requirements will receive a course grade of F and will not receive credit for the course.

Online Homework Assignments

Problem assignments will be given regularly via WileyPlus (approximately one assignment every two weeks). It is your responsibility to check the answers and to take action if you have obviously not understood the latest material. **Those who neglect these assignments do not do well on tests and exams, where the stakes are much higher. Evidence from previous years shows that those who scored well on their homework assignments also scored well in the course.**

Reef Polling

Your mark on the lecture concept polls for the course will be determined as follows:

Points for responding to a concept poll in class:	2 points
<u>Points for the correct response:</u>	<u>1 point</u>
Total points per question asked	3 points

Percent of total points earned:	80 or over	75-79	70-74	60-69	50-59	40-49	30-39	20-29	Under 20
Mark out of 5.0:	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	0

Please note that the threshold was set low to account for occasional absences or technical difficulties. As a result, adjustment to data will only take place if an absence *exceeds* one week of class and is accompanied by official accommodation.

Laboratory

Details of the laboratory portion of this course can be found on the corresponding Brightspace site. If you have any concerns related to the lab after reviewing the material on the Brightspace site, please contact the Lab Coordinator, Spencer Ng (spencerngcheongchung@gmail.carleton.ca)

An important detail is that you must complete all activities of the laboratory portion to receive a passing grade in this course.

Midterm Test

The (online) midterm test will be from 6:00 PM – 8:00 PM on Wednesday November 3. Be ready with a functioning computer, webcam, printer and browser in a quiet location.

Communicating With You

This is a big class, but you will find that you can get any help you need easily by one of the following methods:

1. If it is a course content related question, please post it to the Brightspace forum. Chances are if you have the question, your colleagues do as well and could benefit from the answer.
2. Visit an instructor in their virtual office. I will post office hours on the calendar in Brightspace at least one week in advance.
3. If it is an administration/accommodation related issue, email me directly (david.brock3@carleton.ca). Please note, if it is a course content related question, I will not be responding to it. Those questions should be directed to the Brightspace forum or virtual office hours.
4. Your TAs, fellow students and other people on campus are also great resources and form a great study tool.

Special Arrangements

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 me 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.

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Religious obligation: Please contact me 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.

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Academic accommodations for students with disabilities requiring: 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 me 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 me as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

<https://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 where 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:

<https://carleton.ca/sexual-violence-support/>

Accommodations 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 me 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, see the policy.

<https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

Academic Integrity

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs.

Plagiarism is a serious offence that cannot be resolved directly by the course’s instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

Syllabus

1. A Review of General Chemistry: Electrons, Bonds, and Molecular Properties

Lewis Structures and Formal Charge
Polar Covalent Bonds
Atomic Orbitals
Valence Bond Theory
Molecular Orbital Theory
Hybridized Atomic Orbitals
VSEPR Theory
Dipole Moments and Polarity
Intermolecular Forces
Solubility

2. Molecular Representations
3D Bond-Line Structures
Functional Group Identification
Lone Pairs and Formal Charges
Resonance and Curved Arrows

Delocalized vs Localized Lone Pairs

3. Acid and Bases

Brønsted-Lowry (qualitative and quantitative)
Curved-Arrow Notation
Equilibrium Position
Levelling Effect
Solvating Effects
Counter Ions
Lewis Acids and Bases

4. Alkanes and Cycloalkanes

Nomenclature
Constitutional Isomers
Newman Projections
Conformational Analysis
Cycloalkanes

Boat and Chair Conformations
cis-trans Stereoisomerism
Polycyclic systems

5. Stereoisomerism

Chiral Centers
R and *S* Designations
Optical Activity
Enantiomers and Diastereomers
Fischer Projections
Chiral Compounds
E and *Z* Designations

6. Chemical Reactivity and Mechanisms

Enthalpy
Entropy and Free Energy
Equilibria (reversible/irreversible)
Kinetics
Energy Diagrams
Nucleophiles and Electrophiles
Mechanisms and Arrow Pushing
Carbocation Rearrangements

7. Alkyl Halides: Nucleophilic Substitution and Elimination Reactions

Nomenclature of Alkyl Halides and Alkenes
 S_N1 and S_N2 Reactions (Nucleophile Strength and Solvent Effects)
 $E1$ and $E2$ Reactions
Predicting Products
Synthetic Strategies

8. Addition Reactions of Alkenes

Addition vs Elimination
Hydrohalogenation
Acid-Catalyzed Hydration
Markovnikov and *anti*-Markovnikov

Hydrogenation
Halogenation
syn- and *anti*- addition
Dihydroxylation
Oxidative Cleavage
Predicting Products
Synthetic Strategies

9. Alkynes

Nomenclature
Acidity
Preparation
Reduction
Halogenation
Hydration

14. Infrared Spectroscopy and Mass Spectrometry

Nature of Light and EM Spectrum
Effect on IR Light on Bonds
IR Spectrum Characteristics
Functional Group Identification
Mechanics of Mass Spectrometry
(M)⁺ peak

15. Nuclear Magnetic Resonance

General NMR Theory
Acquiring Spectra
¹H and ¹³C NMR
Integration
Multiplicity
Chemical Shifts
Analyzing ¹H and ¹³C NMR spectra

	Monday	Tuesday	Wednesday	Thursday	Friday
September					
	6	7	8 Classes Begin	9	10
Ch 1-3	13	14	15	16	17
Ch 14	20	21	22 <i>Last day for add/drop/swap</i>	23 WileyPlus Assignment #1 <i>Due 11:55 pm</i>	24
Ch 15	27	28	29	30 <i>Last day to withdraw</i>	1
October					
Ch 4 and 5	4	5	6	7 WileyPlus Assignment #2 <i>due 11:55 pm</i>	8
Ch 6	11 Thanksgiving	12	13	14	15
Ch 7	18	19	20	21 WileyPlus Assignment #3 <i>due 11:55 pm</i>	22
No Labs or Classes	25 Fall Break	26 Fall Break	27 Fall Break	28 Fall Break	29 Fall Break
November					
Ch 7	1	2	3 Midterm 6:00 – 8:00 pm	4	5
Ch 7 and 8	8	9	10	11 WileyPlus Assignment #4 <i>due 11:55 pm</i>	12
Ch 8	15	16	17	18	19
Ch 8	22	23	24	25 WileyPlus Assignment #5 <i>due 11:55 pm</i>	26
December					
Ch 9	29	30	1	2	3
Review	6	7	8	9 WileyPlus Assignment #6 <i>due 11:55 pm</i>	10 Classes End