

# Organic Chemistry 1 - CHEM 2203/2207

Fall 2023

Instructor: Dave Brock

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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.

## Lectures

Lectures are 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. Baring any technical issues, the lectures are also recorded and can be played back at any time.

## Textbook

The text for the course is "Organic Chemistry" 4<sup>th</sup> 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](http://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	--
iClicker	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

**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 typically also scored well in the course.**

### iClicker

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
Points for the correct response:	1 point
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@cunet.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 midterm test will be scheduled by the Registrar's office and will take place on campus, outside of class time the week of Oct 30 (which can include Friday evening, Saturday or Sunday).

### 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. A link to the university's Academic Accommodations can be found here:  
[/students.carleton.ca/course-outline/](https://students.carleton.ca/course-outline/)

For an accommodation request the processes are as follows:

**Deferred term work:** For short term (a week or less) incapacitation, students must complete and submit a self-declaration form (<https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf>) to Dr. Brock ([david.brock3@carleton.ca](mailto:david.brock3@carleton.ca)) within 48 hours of the missed work. For approved missed tests, the weight will be transferred to the final exam.

Long term (longer than 1 week) incapacitation, will be evaluated on a case-by-case basis and discussions of accommodations may involve the Chair of the Department of Chemistry and/or the Office of the Dean of Science.

## 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<sub>N</sub>1 and S<sub>N</sub>2 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)<sup>++</sup> peak

## 15. Nuclear Magnetic Resonance

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

	Monday	Tuesday	Wednesday	Thursday	Friday
<b>September</b>					
	4	5	6 Classes Begin	7	8
Ch 1-3	11	12	13	14	15
Ch 14	18	19 <i>Last day for add/drop/swap</i>	20	21 WileyPlus Assignment #1 <i>Due 11:55 pm</i>	22
Ch 15	25	26	27	28 <i>Last day to withdraw</i>	29
<b>October</b>					
Ch 4 and 5	2	3	4	5 WileyPlus Assignment #2 <i>due 11:55 pm</i>	6
Ch 6	9 Thanksgiving	10	11	12	13
Ch 7	16	17	18	19 WileyPlus Assignment #3 <i>due 11:55 pm</i>	20
No Labs or Classes	23 Fall Break	24 Fall Break	25 Fall Break	26 Fall Break	27 Fall Break
<b>November</b>					
Ch 7	30	31	1	2	3 Midterm this week (date/time TBA)
Ch 7 and 8	6	7	8	9 WileyPlus Assignment #4 <i>due 11:55 pm</i>	10
Ch 8	13	15	15	16	17
Ch 8	20	21	22	23 WileyPlus Assignment #5 <i>due 11:55 pm</i>	24
Ch 9	27	28	29 Lab Exam (in class)	30	1
<b>December</b>					
Review	4	5	6	7 WileyPlus Assignment #6 <i>due 11:55 pm</i>	8 Classes End