

Organic Chemistry 2 - CHEM 2204/2208

Winter 2024

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.

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" 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 through the Brightspace links. Doing this gives you access to an electronic version of the book instead.

2204 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

2208 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. All laboratory experiments **MUST** be completed and all lab reports **MUST** be submitted by the last day of classes (Apr 10, 2024).

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 before the last day of classes (Apr 10, 2024) 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 Feb. 26 (which can include Friday, 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 weekly on Brightspace.
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 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) within 48 hours of the missed work. For approved missed tests, the weight will be transferred to the final exam. In-class iClicker questions have been set for a threshold of 80% of the total marks to receive full marks and therefore include any accommodations for missed classes. No further accommodations will be provided for iClicker marks. Assignments are open for two week periods whereupon the answers are released. In the event that a due date is missed, the work on the assignment up to that point is used for that assignment grade and extensions are not provided. Students are encouraged to start the assignments early. There is a single makeup lab opportunity available to students in the event that they have received a lab deferral. Therefore, missing more than one lab, deferred or not, will result in an F in the course as the course/department requirement that "All laboratory

experiments MUST be completed and all lab reports MUST be submitted by the last day of classes (Apr 10, 2024)” would not be fulfilled.

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 or by generative AI tools;
- 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

10. Radical Reactions

Radicals
Common Patterns in Radical Mechanisms
Chlorination of Methane
Thermodynamic Considerations for
Halogenation Reactions
Selectivity of Halogenation
Stereochemistry of Halogenation
Allylic Bromination
Radical Addition of HBr: Anti-Markovnikov
Addition
Radical Polymerization
Halogenation as a Synthetic Technique

12. Alcohols and Phenols

Structure and Properties of Alcohols
Acidity of Alcohols and Phenols
Preparation via Substitution or Addition
Preparation via Reduction
Preparation of Diols
Preparation via Grignard Reagents
Protection of Alcohols
Preparation of Phenols
Reactions of Alcohols: Substitution and
Elimination
Reactions of Alcohols: Oxidation
Oxidation of Phenol
Synthetic Strategies

13. Ethers and Epoxides; Thiols and Sulfides

Nomenclature of Ethers and Epoxides
Structure and Properties of Ethers
Crown Ethers
Preparation of Ethers and Epoxides
Enantioselective Epoxidation
Reactions of Ethers
Ring-Opening Reactions of Epoxides
Thiols and Sulfides
Synthetic Strategies Involving Epoxides

16. Conjugated Pi Systems and Pericyclic Reactions

Classes of Dienes
Conjugated Dienes
MO Theory
Electrophilic Addition
Thermodynamic vs Kinetic Control
Diels-Alder Reactions
Electrocyclic Reactions
UV/Vis Spectroscopy

17. Aromatic Compounds

Introduction to Aromatic Compounds
Nomenclature of Benzene Derivatives
Stability of Benzene
Criteria for Aromaticity
Reactions at the Benzene Position
Reduction of Benzene and Its Derivatives
Spectroscopy of Aromatic Compounds

18. Aromatic Substitution Reactions

Electrophilic Aromatic Substitutions
Halogenation
Sulfonation
Nitration
Friedel-Crafts Alkyl and Acylations
Activating and Deactivating Groups
Directing Effects of Substituents
Synthesis Strategies
Nucleophilic Aromatic Substitutions
Elimination-Addition

19. Aldehydes and Ketones

Nomenclature
Preparing Aldehydes and Ketones
Nucleophilic Addition Reactions
Oxygen, Nitrogen, Sulfur, Hydrogen,
Carbon
Hydrolysis of Acetals, Imines, and
Enamines
Baeyer-Villiger Oxidation of Aldehydes and
Ketones
Synthesis Strategies
Spectroscopic Analysis of Aldehydes and
Ketones

20. Carboxylic Acids and Their Derivatives

Nomenclature
Structure and Properties of Carboxylic Acid
Preparation and Reaction of Carboxylic
Acids
Carboxylic Acid Derivatives and their
Reactivities
Preparation and Reactions of Acid Chlorides
Preparation and Reactions of Acid
Anhydrides
Preparation and Reactions of Esters
Preparation and Reactions of Amides
Preparation and Reactions of Nitriles
Synthesis Strategies
Spectroscopy of Carboxylic Acids and Their
Derivatives

22. Amines

Nomenclature
Structure and Properties of Amines
Preparation of Amines
via Substitution Reactions
via Reductive Amination
Synthesis Strategies
Acylation of Amines
Hofmann Elimination
Reaction of Amines with Nitrous Acid
Reaction of Aryl Diazonium Ions
Nitrogen Heterocycles
Spectroscopy of Amines

	Monday	Tuesday	Wednesday	Thursday	Friday
January					
Intro and Ch 10	8	9	10	11	12
Ch 10 and 12	15	16	17	18	19 <i>Last day for add/swap</i>
Ch 12 and 13	22	23	24	25 <i>WileyPlus Assignment #1 Due 11:55 pm</i>	26
Ch 13 and 16	29	30	31 <i>Last day for withdrawal</i>	1	2
February					
Ch 16	5	6	7	8 <i>WileyPlus Assignment #2 due 11:55 pm</i>	9
Ch 17	12	13	14	15	16
No Labs or Classes	19 Spring Break Holiday <i>(University Closed)</i>	20 Spring Break	21 Spring Break	22 Spring Break	23 Spring Break
Review and Ch 18	26	27	28	29 <i>WileyPlus Assignment #3 due 11:55 pm</i>	1 Midterm this week (date/time TBA)
March					
Ch 18	4	5	6	7	8
Ch 19	11	12	13	14 <i>WileyPlus Assignment #4 due 11:55 pm</i>	15
Ch 19 and 20	18	19	20	21	22
Ch 20	25	26	27	28 <i>WileyPlus Assignment #5 due 11:55 pm</i>	29 <i>Holiday (University Closed)</i>
April					
Ch 22	1	2	3	4	5
Ch 22 and Review	8	9	10 <i>WileyPlus Assignment #6 due 11:55 pm</i> Classes End	11	12