CHEM 4305 (5606) for Term Winter 2025

Environmental Chemistry & Toxicology

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

Course Instructor: Sierra Peskett

Email: sierrapeskett@cmail.carleton.ca

Best Ways to be in Touch: in class or via email

Please allow up to 2 business days for an email response. All correspondence should be through your Carleton/UOttawa account and use a professional tone.

Student Hours: Friday, 10-11am, Zoom
*In the event that I will cancel a student hour due to an infrequent scheduling conflict, the make up hours that week will be posted on Brightspace

Office Location: NA. Please send an email to arrange an in-person or Zoom meeting.

Class Location: Please check Carleton Central for the room location.

Class Times: Tuesdays, 8:35 - 11:25 am

Prerequisites: CHEM 2203 (or CHEM 2207), and CHEM 2800 or CHEM2103, or BIOC 3101 or permission of the department.

Preclusions: Additional credit for CHEM 5606 students.

Department/Unit: Chemistry

Topics Covered and Learning Outcomes

All students in the class, the instructor, and any guests should be treated with respect during all interactions. It is my hope that our class will support diversity of experience, thought, and perspective.

Course Description

Overview of environmental chemistry and toxicology principles including chemical sources, fate, and effects in the environment. Examining organic reactions occurring in abiotic environments and biological systems, and studying aspects of toxicant disposition and biotransformation. Emphasis on contemporary problems in human health and the environment.
Prerequisite(s): CHEM 2203 or CHEM 2207, and CHEM 2800 or CHEM 2103, or BIOC 3101 or permission of the department.
Also offered at the graduate level, with different requirements, as CHEM 5606, for which additional credit is precluded.
Lectures three hours a week.

Topics to be Covered

Week	Topic	Unit	Deadlines
1 - Jan 7	Intro, Syllabus, AI Review Paper, Science Communication		
2 - Jan 14	Photolysis & Atmospheric Oxidation	1	
3 - Jan 21	Aqueous Oxidation, Substitution & Elimination	1	
4 - Jan 28	Ester Reactivity & Reduction	1	
5 - Feb 4	Partition Coefficients & Environmental Distribution	2	Assignment 1
6 - Feb 11	Bioaccumulation, Adsorption and Biological Distribution	2	AI Review Paper
7 - Feb 18	**WINTER BREAK**		
8 - Feb 25	Reductive and Oxidative Strategies, Elimination, Substitution and Hydrolysis	3	Assignment 2
9 - Mar 4	Chemical Bioactivation & Organ Selective Toxicity I	3/4	
10 - Mar 11	Organ Selective Toxicity II	4	Assignment 3
11 - Mar 18	Organ Selective Toxicity III & Peer Review	4	Term Paper Draft - **March 17 8pm**

12 - Mar 25	Oxidative Stress & Involvement of Cell Signaling	4	Peer Review
13 - April 1	Receptor Toxicity	4	Term Paper Final
14 - April 8	Case Study/Future Learning Lab (tentative)		Assignment 4

COURSE LEARNING OBJECTIVES
Unit 1: Organic reactions in the abiotic environment – Explain the environmental fate of organic chemicals we use in our everyday lives.
Unit 2: Partitioning and distribution – Use fundamental chemical principles to predict where we can find a chemical (e.g. the air, water, soil, humans/animals).
Unit 3: Organic reactions in biological systems – Describe the defense mechanisms used by an organism to protect itself from foreign chemical exposure.
Unit 4: Toxicant mechanisms of action – Explain fundamental mechanisms by which foreign chemicals disturb biological processes.

Assessments

Grade Breakdown

Component	Grade Value	Due Date *11:59 PM of listed day
Assignment 1	15 %	February 4, 2025
Assignment 2	15 %	February 25, 2025
Assignment 3	15 %	March 11, 2025
Assignment 4	15 %	April 8, 2025
AI Review Paper	15 %	February 11, 2025
Peer Review	5 %	March 25, 2025
Term Paper	15 %	April 1, 2025
Participation	5%	April 8, 2025
Extra Credit	5%	April 8, 2025

Assignments: Four assignments are to be completed during the term. The assignments will consist of material relevant to the lecture material and will include short answer questions. The completed assignments must be submitted through Brightspace by 11:59 pm of the due date. Each assignment is marked for the quality of its content and has a value of 15% of the total course grade.

AI Review & Term papers – Students will answer a broad question that synthesizes several concepts learned throughout the course. Each paper will be no more than 750

words. Further guidelines for these term papers will be provided separately. The term paper drafts must be submitted through Brightspace by 11:59 pm of the due date.

Peer review session: Draft 1 of the term paper will be peer-reviewed either during class or outside of class between March 18 and 25, 2025. I will assign partners or small working groups. Students will peer-review each other using provided peer-review guidance sheets. Students must participate in the peer-review, by submitting draft 1 of the term paper and by providing your peers with feedback: both quantity and quality of contributions will be evaluated and factor into the peer-review grade. Peer-reviews must be submitted through Brightspace by 11:59 pm of the due date. **Failure to submit either Draft 1 or the peer-review will result in a 0/5.**

Participation: This course will involve class discussions, reflections and paired/small group activities. Students can earn up to 5% in this course through active participation and contribution during class.

Extra Credit Incentive Program Information: This course has been registered in the Incentive Program offered through the Centre for Student Academic Support (CSAS). CSAS Learning and Writing Support Workshops are designed to help students cultivate and refine their academic skills for a university environment. To earn 5% marks towards extra credit, students are expected to complete 5 workshops throughout the term. The workshops must be completed by April 8, 2025 to receive credit for the Incentive Program. Students will need to download a Record of Completion PDF for each applicable workshop and submit it to an assignment submission box within Brightspace.
Required incentive program workshops for CHEM 4305/5606

- Academic Integrity
- Academic Reading
- Critical Thinking
- Editing and Proofreading
- Introduction to Fundamentals of Academic Writing

Late and Missed Work Policies

Late Work

Handing in the Peer Review late will automatically result in a 0

You will not receive peer review feedback on your Term Paper if the draft is late

For all other work, you will lose 10% per day up to 4 days late, after which you will be given a 0. If there are circumstances surrounding the lateness, you may email to ask for an extension a minimum of 24 h before the work is due.

Missed Work

Short-term (5 days or less): If you have missed work due to extenuating circumstances, you may fill in the academic considerations form and we will discuss a course of action.

Long-term (> 5 days): If you have missed work due to extenuating circumstances, you may fill in the longer-term accommodation form. The circumstances must be extreme and this must be a last resort. There should be a clear reason why you have missed asking for an extension before the deadline and missed asking for accommodation within 5 days of the deadline.

Learning Material(s) and Other Course/Lab-Related Resources

Learning Material	Options for Purchasing *(e.g. Bookstore, Used, etc.)*	Approximate Cost
D.G. Crosby. Environmental Toxicology and Chemistry (1998), Oxford University Press.	Available at MacOdrum Library	$0
R. Schwarzenbach. Environmental Organic Chemistry (1993), Wiley Publishing.	Available at MacOdrum Library	$0
D. Jacobs. Introduction to atmospheric chemistry. Chapter 11: Oxidizing Power of the atmosphere	http://acmg.seas.harvard.edu/publications/jacobbook/index.html	$0
T. Soderberg. Libretexts: Organic chemistry with a biological emphasis Chapter 8, sections 8.1-8.5	https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry_Textbook_Maps/Map%3A_Organic_Chemistry_with_a_Biological_Emphasis_(Soderberg)/Chapter_08%3A_Nucleophilic_substitution_reactions_I	$0
T. Soderberg. Libretexts: Organic chemistry with a biological emphasis Chapter 12	https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry_Textbook_Maps/Map%3A_Organic_Chemistry_with_a_Biological_Emphasis_(Soderberg)/12%3A_Acyl_substitution_reactions	$0

Students are not required to purchase textbooks or other learning materials for this course.

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (https://students.carleton.ca/course-outline/).

Statement on Chat GPT/Generative AI usage

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

We will be using AI in this course. In broad terms here is what is acceptable and unacceptable. As mentioned above, please discuss any concerns or "gray areas" with the instructor.

Acceptable:

- AI checks the spelling, grammar and tone of something you wrote (ex. Grammarly AI)
- You clearly cite the statement as coming from an AI source (with version number if applicable) for comparison/analysis. (ex. When asked, ____? ChatGPT 3.0 replied: _____.)

Unacceptable:

- You ask an AI service to complete an Assignment, write a Term Paper (Draft or Final) or write a Peer Review

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when it is not permitted (see above).

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

Copyright

All course material such as slides, lecture notes, the lecture itself, recordings and assignments are all protected by copyright. Recording, copying or sharing these materials, on websites or directly with a person outside of this class, without permission is a violation of copyright.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

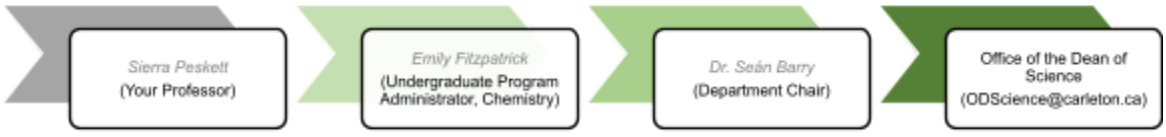
Mental Health and Wellness:

As a student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. For more information, please consult https://wellness.carleton.ca/.

Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):

Note: You can also bring your concerns to Ombuds services.



Assistance for Students

Writing and Learning Support: https://carleton.ca/csas/support/
Science Student Success Centre: https://sssc.carleton.ca/