

Schedule (all interactions by Zoom)

Classes: Tues/Thurs 14:00-15:00 online <https://utoronto.zoom.us/j/93918837434> Passcode: 875165

Recordings of classes will be posted to allow asynchronous viewing.

Tutorial: Friday 9:00-10:00, 12:00-1:00, 2:00-3:00, or 3:00-4:00 online (synchronous only)

<https://utoronto.zoom.us/s/96744722380> Passcode: 191860

Tutorial sessions will not be recorded.

Student hours: Monday 11:00-12:00 (use tutorial Zoom link), Thursday 15:00-16:00 (stay in class Zoom session) or by appointment

Contact Information

Instructor: Professor Jennifer Murphy, jen.murphy@utoronto.ca

TAs: Matthew Davis (mg.davis@mail.utoronto.ca)

Carolyn Liu-Kang (carolyn.liukang@mail.utoronto.ca)

Please contact Professor Murphy or a TA if you have any questions or problems. Email is fine for short questions, but conceptual issues are best handled in person via Zoom in student hours, or by appointment. The teaching team will endeavour to respond to emails within 24 hours on weekdays.

Course website is on Quercus: <https://q.utoronto.ca> (use your UTORID). You are responsible for checking this site regularly for announcements and content. Skeletal Class notes are posted 24 hours prior to each Class. Assignments and quizzes will be submitted electronically via Quercus. Summative evaluation will also be performed online.

Required textbook *Environmental Chemistry*, 5th edition, Colin Baird and Michael Cann, W.H. Freeman and Company (new or used at UofT bookstore, various libraries). Practice problems at the end of the assigned chapters are a good way to evaluate your understanding.

Course description

This course considers the processes that control the fate of chemicals in the environment. We will focus on the chemistry of the atmosphere, hydrosphere, and soils, especially as it pertains to pollution of these environmental compartments. The primary goal of this class is to describe the workings of a complex chemical system using concepts such as chemical kinetics, thermodynamics and oxidation/reduction. The secondary goal is to develop a detailed understanding of a number of important environmental phenomena, such as urban smog and groundwater contamination.

Tutorial objectives

The tutorial is a critical element of this course, and weekly attendance is expected. The tutorial will provide an opportunity for guided group problem-solving, discussion of news stories related to Class material, and will enhance what is covered in the class and textbook. In addition to the problems tackled during the tutorial, practice problems from the textbook and the solutions to weekly quizzes will also be discussed.

Pre-requisite courses

CHM135H/CHM151Y, (MAT135H, MAT136H)/MAT137Y/MAT157Y

Expectations regarding online etiquette

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Grading (maximum of Scheme 1 or Scheme 2 for each student)

	Scheme 1	Scheme 2
Assignments (due Sep 21, Oct 5, Oct 19, Nov 2, Nov 23, Dec 7)	40 %	45 %
Press Release (due Nov 18)	10 %	15 %
Pre-tutorial Quizzes	15 %	15 %
Final assessment (online, cumulative, during finals period)	35 %	25 %

Note: if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affects availability or functionality, it may be necessary to revise the timing/weighting of the assessments.

Assignments (due Sep 21, Oct 5, Oct 19, Nov 2, Nov 23, Dec 7 at 5:00 pm ET)

The assignments include a mix of qualitative and quantitative questions following the topics covered in Class. They will be assigned as Jupyter Notebooks (<https://jupyter.org/>) which will allow you to learn and use the Python programming language to answer the questions. Completion of the assignments should not only further your understanding of the course material but also teach you the basics of scientific computing, data analysis and plotting. You do not need pre-existing knowledge of Python or computer programming (these assignments can be completed from wherever you access the internet currently).

Press Release (due Nov 18 at 5:00 pm ET)

You will write a press release (450-550 words) about a 2020 journal article from Environmental Science and Technology (ES&T). The selected article should have an environmental chemistry theme and ideally be related to a topic covered in this course. Specific guidelines will be provided online and discussed in Class.

Quizzes (due by 9 am ET Friday on most weeks)

Quizzes will be administered via Quercus and consist of a few questions that evaluate your understanding of the Class material and related problems from the previous week. Reviewing your course notes, completing the practice problems from the textbook, and actively participating in tutorials are the best way to prepare for the quizzes.

Late Penalties

Submitted work (Assignments and Press Release) will be penalized 10 % per day of lateness. Quizzes cannot be submitted late. You will be permitted to drop your lowest two quiz grades.

Technology requirements

Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: <https://www.vicprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/>

Advice for students more broadly regarding online learning is available here:

<https://onlinelearning.utoronto.ca/getting-ready-for-online/>

Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability or health consideration that may require accommodations, please feel free to approach Professor Murphy and/or Accessibility Services at (416) 978 8060; <http://www.studentlife.utoronto.ca/as>

Absences

Students who miss classes are responsible for making up the missed material. Class recordings will be posted online to allow for asynchronous viewing. Recordings of tutorial sessions will not be publicly posted because they will consist of a significant amount of participation and small group discussion. Students who require consideration for missed academic work for any reason (e.g., COVID, other illness or injury, family situation) should report their absence through the online absence declaration. The declaration is available on ACORN under the Profile and Settings menu. Students should also advise Professor Murphy of their absence.

Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <https://www.academicintegrity.utoronto.ca/>).

Use of Turnitin

Turnitin.com may be used for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their written work to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

Class Schedule

Class 1 Overview, syllabus, earth system concepts (pages xix-xxv)

Atmospheric Chemistry (Part I of Baird and Cann)

Class 2 Stratospheric chemistry, Chapman cycle (pages 1-20)
Class 3 Stratospheric chemistry, catalytic ozone destruction (pages 20-33)
Class 4 Stratospheric chemistry, ozone hole (pages 37-64)
Class 5 Tropospheric chemistry, VOC oxidation (pages 69-76 and 755-771)
Class 6 Tropospheric chemistry, smog and NO_x (page 76-83)
Class 7 Air pollution, sulphur emissions and oxidation (pages 109-118, 771-772 and Appendix 1)
Class 8 Air pollution, particulate matter (pages 118-130)
Class 9 Tropospheric chemistry, smog control strategies (pages 84-101)
Class 10 Consequences of air pollution: acid rain and human health (pages 135-152)
Class 11 Biogeochemical cycle of nitrogen and redox review (Appendix (AP1-AP2) and pages 193-195)

Water Chemistry and Water Pollution (Part III of Baird and Cann, page numbers refer to 5th edition)

Class 12 Natural waters and dissolved oxygen (pages 409-417)
Class 13 Dissolved organic matter, sulfur and acid mine drainage (pages 419-424)
Class 14 Redox chemistry and the pE scale (pages 424-430)
Class 15 Mercury biogeochemistry (pages 519-536)
Class 16 Water in equilibrium with carbon dioxide and carbonate (pages 431-442)
Class 17 Water in equilibrium with carbon dioxide and carbonate, continued (pages 431-442)
Class 18 Ions in water (pages 442-450)
Class 19 Pollution and purification of water (pages 455-460)
Class 20 Water disinfection (pages 460-477)
Class 21 Lead in drinking water and the environment (pages 527-552)
Class 22 Groundwater and inorganic contamination (pages 478-487)
Class 23 Groundwater organic contamination and remediation (pages 487-498)
Class 24 Impacts of pandemic economic shutdown on environmental chemistry