CHEM 3305A/B for Fall 2025 and Winter 2026
Advanced Analytical Chemistry Laboratory

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.

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.

Course Instructor Section A: David Brock

How to address me: Anything respectful (ex. Dave, Doc Brock, Dr. Brock, etc.)

Email: David.Brock3@Carleton.ca

Best Ways to be in Touch: via email

Student Office Hours: By Appointment

Office Hours Location: Room 226, SC Building

Lab Supervisor:

Graham Galway graham.galway@carleton.ca

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

Lab Times: Fridays, 8:30am-12:30pm

Prerequisites: CHEM 2302 or CHEM 2303

Preclusions: CHEM 2207 or 2203

Department/Unit: Chemistry

Lab TA:
Jocelyn Menard
jocelynmenard@cmail.carleton.ca

Learning Outcomes and Topics Covered

- Analytical skills – demonstration of proper lab techniques.
- Calculation – accurate concentrations, correct unit conversion, and proper statistical analysis.
- Creativity – independent operation of instrument and implementation of procedural steps.
- Critical thinking – quality assessment of your lab work.
- Knowledge – fundamental theory and practical application of analytical techniques: electrochemical analysis, gas chromatography, immunoassay, ion chromatography, liquid chromatography, as well as sampling/preparation/treatment, analyte extraction/preconcentration/recovery, matrix purification/interference removal, standard calibration curve, internal standards and standard additions.
- Oral communication - with lab partner, TA/lab supervisor/instructor, and other groups in describing your scenario.

• Planning – familiarization with the instrument working principle and experimental procedure.
• Problem solving – diagnosing environmental problems, researching analytical solutions, attempting first approach, assessing whether that works, and formulating alternative solution.
• Reporting – effectively sharing your Rideau River project analysis data and results in graphical and tabulated formats.
• Safety – carefully working in the lab with full understanding of potential hazards when handling chemicals.
• Teamwork – willingness to help your lab partner or assist other group members when possible.
• Time management - effective use of time during each 4-hour lab.
• Training – capacity for training by TA/lab supervisor/instructor and requesting assistance when needed.
• Written communication – skills to formulate clear and concise responses within lab reports.

Course Description
Advanced instrumentally based techniques of analysis. Emphasis on identification and quantitation of low-level contaminants in environmental matrices using chromatographic and spectroscopic methods, including sampling, cleanup, measurement and reporting of results.
Includes: Experiential Learning Activity

Experiments to be Covered

1. *Determination of Phenols in Water*
2. *Determination of PCB organic compounds in a Sediment Sample*
3. *Determination of Atrazine by Immunoassay*
4. *Determination of Aldehydes in Indoor Air*
5. *Determination of Arsenate in Beer*
6. *Determination of Atrazine and Simazine in Water*
7. *Determination of Selenium in Pharmaceutical Products*

Additional important dates and deadlines can be found here: https://carleton.ca/registrar/registration/dates/academic-dates/, including class suspension for fall, winter breaks, and statutory holidays.

Mandatory required materials:
Access to a Computer, Microsoft Word and Excel (or equivalent software for Mac computers)

Assessments

Grade Breakdown

Component	Weighting (%)
2 individual formal reports (Exp. 1/6 or Exp. 3)	30
3 team/individual short reports	25
Scenarios	
Scenarios written report (by TA)	5
Scenarios presentation	10
Laboratory skills and techniques	
TA evaluation	10
Instructor evaluation	5
Co-Ordinator evaluation	5
Rideau River Project	10

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.
2. All laboratory experiments MUST be completed and all lab reports MUST be submitted by the last day of classes (Apr 8, 2026).

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

Lab Schedule and Lab Manual
Posted on Brightspace

General notes by TAs and Error Analysis Handout
Posted on Brightspace

Reports

Reports should be submitted 2 weeks after each experiment is finished. All reports should be submitted electronically on Brightspace. Please ensure that your name, student number and lab section (A or B) appear in the file name you upload.

Formal reports are typically shorter than 10 pages (1.5-line spacing) plus figures, tables and calibration curves. The introduction need not be longer than 1 page, and 2-3 pages of theory are good enough. Students should not copy any information from the lab manual or any generative AI platform/tools. You may focus on experimental, data,

calculations, results, discussion, and conclusion. A high mark will go to a report that is rich in discussion, organized in presentation, correct in calculations, logical in writing, and polished in style. More guidelines on the mark breakdown for CHEM 3305 formal reports are posted on Brightspace. Collaborating on formal reports is strictly disallowed. You must complete the work by yourself. If you need help, please see your TA or Dr. Brock.

Short reports are typically less than 7 pages (1.5-line spacing) plus figures, tables and calibration curves. Introduction, theory, and experimental sections are not required. More guidelines on the mark breakdown for CHEM 3305 short reports are also posted on Brightspace. Short reports may be submitted as lab partners.

Note that plagiarism is easy to detect and temptation must be resisted.

Scenarios

All students in CHEM 3305 will complete the Scenarios assignment. The scenarios will consist of two parts, a written report graded by the TA and a presentation conducted before the class and graded by the teaching team. Each group will be provided with a scenario that will require the development of an experimental approach to answer the question or solve the problem presented. Each group will write a report that outlines their plan of action for solving the presented problem or question. The report must include but is not limited to the following concepts, sampling requirements (sampling locations, types of samples, and sample preparation etc.), the experiment design and the rationale, and any related theory to support the experimental design. The report should be no longer than 7-9 pages (double line spacing). The report will be submitted to the TA in December, graded and returned in January and presentations will be in a scheduled lab period in February. See schedule for exactly dates. The oral presentation, to the class and teaching team, will utilize PowerPoint slides of the experimental design followed by a group discussion with the teaching team on the rationale for the experimental design and any related theory.

Rideau River Project

All students in CHEM 3305 will participate in a project that will involve testing water samples collected from the Rideau River. These samples will be analyzed by employing the methods used in experiments 1, 2, 5, 6, and 7 as well as being analyzed for total organic carbon. Each group within a section will also collect sediment samples from the Rideau River and perform analyses on them throughout the year. The entire class will aggregate the individual group results and prepare a final report and a presentation.

The report will include all raw data (i.e. chromatograms, etc.), sample calculations, individual and aggregated results with appropriate uncertainties, and a full discussion. The presentation will be 30-40 minutes which will occur during the scheduled lab period towards the end of the winter term (See schedule for exact date). The presentation should cover the methods employed and the results obtained. All students in the class are expected to participate in the presentation.

Late and Missed Work Policies
Late Work

Students have *two weeks* (see the lab schedule for due dates) to complete and submit their lab reports for each lab. As a result, lab reports that are submitted late for any reason will be subject to the late penalty of 10% per day, with a mark of 0 assigned if an assignment is submitted more than 4 days late. Therefore, you are encouraged to submit your lab report a day or two early, to ensure that you have no issues with your lab submission.

Missed Work

For short term (a week or less) incapacitation, students must complete and submit the Academic Consideration for Coursework Form - Registrar's Office (https://carleton.ca/registrar/academic-consideration-coursework-form/) within 48 hours of the missed work. 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 8, 2026)" 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 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/).

AI Use in This Course

Students may ONLY use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor)

Documenting AI Use: It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor.

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.

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.

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/.