Intro. Phys. Chem. II Syllabus

Department of Chemistry

CHEM2304 Winter 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Ryan MacDonell	rymac@dal.ca	TBD based on Brightspace poll
Gianna Aleman	gianna.aleman@dal.ca	Monday – Friday, 11:30 am – 12:00 pm, Room 1051

Course Description

The physical properties of chemical systems at the level of atoms and molecules are examined. Topics include the quantum mechanical description of atoms and molecules, chemical bonding, experimental and computational methods for studying molecular systems, and the kinetics of chemical processes.

Course Prerequisites

CHEM 1011.03/CHEM 1012.03 or equivalent; MATH 1000.03 and MATH 1010.03 or equivalent (grade of C- or better). PHYC 1190.03/PHYC 1290.03 or PHYC 1310.03/PHYC 1320.03 is strongly recommended.

Course Exclusions

N/A

Student Resources

Students are welcome to use the Chemistry Resource Centre (1st floor of the Chemistry Building by the main stairway) during its opening hours. Office hours will be held for lecture materials in Chemistry Building Room 535, with dates and times to be determined based on a Brightspace poll to minimize conflicts with courses and labs. Office hours are also available for the lab section, with times given above.

Course Structure

Course Delivery

Lectures will be delivered in-person on Tuesdays, recorded, and posted on Brightspace. Supplemental lectures with example problems and solutions will be recorded and posted on Brightspace for asynchronous viewing. Assignments will be in-person only, on Thursdays during the lecture time. The midterm and final exam will be in-person only.

Lectures

Tuesdays and Thursdays from 10:05 AM to 11:25 AM in Chemistry Building 223.

Laboratories

The laboratory component is worth 20% of the final grade. The laboratory will start the week of Jan. 12, in Chemistry Building room 115P.

The laboratory will run weekly, or as scheduled. For lab days and times, check the schedule on the lab Brightspace site.

Current scheduled laboratory sessions:

All aspects related to the laboratory format, expectations, policies, help sessions, and more, can be found in the ‘Intro Module: Lab Syllabus’, available on the lab Brightspace website. All students are required to complete the ‘Intro Module: Lab Syllabus’ during the first week of lab.

Tutorials

N/A

Course Materials

No textbooks are required for the course, but the course notes are loosely based on Physical Chemistry by Atkins and de Paula (8th and 9th editions).

All lab modules and instructions pertaining to the lab will be provided on the lab - Brightspace site.

Laboratory Requirements

- Laboratory manual: CHEM2304 Laboratory Manual is required (University bookstore)
- Safety glasses (CSA Z94 3 or Z87.1) are mandatory in the laboratory
- Lab coats are mandatory in the laboratory
- A hard cover notebook is required
- A USB flash drive is required to store data

All required materials can be purchased from the Dalhousie bookstore.

Assessment

Assignments

There will be weekly **short** assignments (10 in total) over the course of the semester. Assignments will be in-class, and should be short enough for most students to complete halfway through class time. The assignment questions will be equivalent to long-answer exam questions. Students can work together and can ask questions during the assignment time, similar to office hours, but it is strongly suggested that students attempt the questions on their own first. The top 8 of the 10 assignments will count towards the final grade. The assignments are worth 30% of the final grade.

Tests/quizzes

There will be a single midterm on Thursday February 12 during course hours (10:05 AM to 11:25 AM in Chemistry 223), worth 10-20% of the final grade (whichever option maximizes the final grade). The midterm material will include all topics covered up to that point: group theory, quantum, orbitals and structure.

Final exam

The final exam will take place during the scheduled exam period (date and time TBD), worth 30-40% of the final grade (whichever option maximizes the final grade). The exam will include all topics covered during the semester.

Other course requirements

To pass the course, you must pass the laboratory component. To pass the lab, a minimum grade of 50% must be obtained in the lab portion of the course, and all

laboratory modules must be completed. A minimum of a 40% grade on the weighted midterm and final exams is required to pass the course (i.e. 0.2×(midterm grade) + 0.8×(final exam grade) > 40% or 0.4×(midterm grade) + 0.6×(final exam grade) > 40%).

As a student in the Department of Chemistry at Dalhousie, and as part of your chemistry laboratory class requirement, you are REQUIRED to complete the following training:

- WHMIS (Workplace Hazardous Materials Information System) course
- Chemistry Safety Module
- Lab map (in lab activity with the instructor)

For deadlines and further details about the mandatory safety training consult the laboratory manual and the lab Brightspace website.

Laboratory exemptions may be granted only to students who have previously completed **all laboratory experiments**, earned a **final laboratory grade of at least 60%**, a **final course grade of at least 50% (D)**, and are repeating the course **within two (2) years** of the term in which the laboratory credit was originally obtained. Students who believe they may be eligible must contact the instructor **within the first week of the laboratory program**. If approved, the previous laboratory grade will be carried forward. **Partial exemptions are not permitted**, and exemptions are **not automatic**. Students who are denied an exemption must repeat the laboratory program. To apply, contact **Dr. Gianna Aleman (gianna.aleman@dal.ca)**.

Conversion of numerical grades to final letter grades follows the Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

Students are expected to complete assignments and the midterm at the designated time.

Students with a reasonable excuse or accommodation for missing a scheduled midterm or assignment may write a deferred midterm/assignment. Reasons for requiring a deferred assessment should be communicated no less than two weeks before the scheduled assessment, except in cases of emergency or sudden illness. The deferred assessment will be scheduled outside of course hours, based on the

availability of those who need the deferral. Please note that two assignments can be missed without penalty.

Course Policies related to Academic Integrity

Students are allowed to work together on assignments but must submit their work individually. As with written work, two assignments with the same techniques and ideas are acceptable, but two assignments that are exact copies of each other constitute plagiarism. It is strongly suggested that students first try assignment problems individually.

As the name suggests, large language models (e.g. ChatGPT) are based on language, not math, and their free versions are not likely to provide reliable results for assignments in this course. Nonetheless, if AI tools are used, students should declare how they were used on the assignment. Tools like Wolfram Alpha, Mathematica, and Maple are good resources for checking results and may be used during assignments, but students are still expected to show their work based on the material taught in class. An answer with no explanation is worth zero points (with the exception of short answer exam questions, e.g. multiple choice).

In the Physical Chemistry lab, we acknowledge that AI tools like ChatGPT, Grammarly, or AI-assisted Excel analysis, are becoming more widely used in education and research. These tools can support your learning when used responsibly, but it's essential that they do not replace your own thinking, especially in assignments designed to help you practice critical thinking skills.

This is why we allow AI support in limited, transparent ways, while still ensuring that the core reasoning and content come from you. We're not trying to "catch" AI use, but to help you learn how to use these tools thoughtfully, responsibly, and ethically as part of your learning process.

In this context, here are the expectations for AI use in the Physical Chemistry Lab Reports:

You **may** use AI tools for:	You **may not** use AI tools to:
Grammar or language suggestions/corrections	Generate full lab report sections (e.g., Results or Discussion)
Help organizing or outlining ideas	Create fabricated or speculative scientific content
Rewording or simplifying your own writing	Analyze your data or draw conclusions for you
Quick clarification of scientific terms	Paraphrase someone else's work to make it look like your own

Under this model, a student unable to demonstrate an understanding of their own work is considered to have earned a failing grade and not to have committed an academic offence.

Learning Objectives

Students will learn the origin of several fundamental concepts in chemistry, such as symmetry, orbital theory, the structure of molecules, molecular spectra, the dynamics of molecules, and rates of reactions.

Course Content

Week	Date	Lesson Topic(s)	Reading/Assessment
0.5	Jan. 8	Math review	
1.5	Jan. 13, 15	Group theory	Assignment 1
2.5	Jan. 20, 22	Intro to quantum	Assignment 2
3.5	Jan. 27, 29	Orbitals	Assignment 3
4.5	Feb. 3, 5	Structure of molecules	Assignment 4
5.5	Feb. 10, 12	Review + midterm	
6.5	Feb. 24, 26	Spectroscopy	Assignment 5
7.5	Mar. 3, 5	Spectroscopy	Assignment 6
8.5	Mar. 10, 12	Dynamics	Assignment 7
9.5	Mar. 17, 19	Kinetics	Assignment 8
10.5	Mar. 24, 26	Kinetics	Assignment 9
11.5	Mar. 31,Apr. 2	Kinetics	Assignment 10
12	Apr. 7	Exam Review	

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at:

https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about/mission-vision-values/global-relations.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/campus_life/ssc.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.