Carleton UNIVERSITY

Faculty of Science
Department of Chemistry

CHEM 1011 General Chemistry I
Fall 2024 Syllabus

1. Overview

Calendar Description: CHEM 1011 A
Prerequisite(s): 4U Chemistry (or equivalent grade 12 chemistry)

Instructor: Jasmine Chihabi

Email: jasminechihabi@cunet.carleton.ca

Office Hours: Tuesday, from 10:00 AM – 11:00 AM in 115 Steacie

Lecture: Tuesday and Thursday, from 11:35 AM – 12:55 PM in 3202 Richcraft Hall.

Laboratory: Times and locations are listed on Carleton Central. Refer frequently to the tabulated schedule of laboratory experiments and assignments in this document.

2. Learning Resources

i. **Lectures**: Lectures are synchronous and mandatory. You are encouraged to participate.

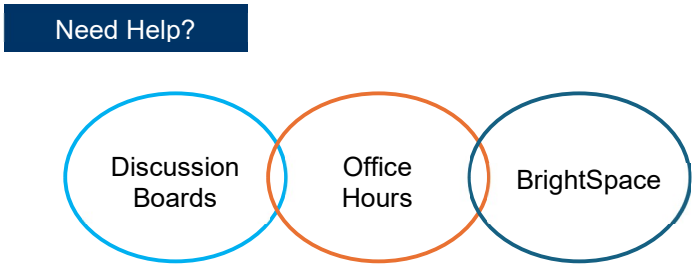
ii. **Textbook**: The text for the course is "Chemistry" 4th Canadian Edition by Olmsted, Williams and Burk published by Wiley. The book is available from Carleton's bookstore, however, permanent electronic access is also available through the instructions listed on the course Brightspace page at a discounted price. We recommend buying the latter option.

iii. **Scientific Calculator** with ln, e^x, $\log_{10}$ and 10^x functions. Note: calculators or notebook computers capable of storing information are **NOT** allowed during tests/exams, i.e. most graphing calculators.

iv. **Pearson Mastering Chemistry Online Homework**: required to complete the assigned online homework. One must purchase access to a Mastering Chemistry account. To set-up your account, you must follow the registration instructions provided on the Brightspace site under Content >> Course Resources >> Pearson Mastering Chemistry Info. Those who neglect the assignments do not typically do well on tests and exams!

v. **Molecular Model Kit** (optional). This kit helps with visualising 3D molecular shapes and organic structures, as well as completing the assigned Aspects of Organic Chemistry lab exercises. A kit can be purchased from the University Bookstores. I recommend the Molecular Visions Model Kit.

vi. **CHEM 1011 Website** – access through Brightspace. Your Username is the part of your CU e-mail address before the "@" sign. Your password is the same as your University e-mail. The course has the same Brightspace as the laboratory. The course website provides a wealth of resources. Announcements relating to course material will be given on Brightspace or you will be notified by email. It is your responsibility to check this site and your email on a regular basis.



vii. **Instructor Office Hours** – Unless otherwise communicated, office hours will be held in Steacie Building, Room 115 on every week on Tuesdays from 10:00 AM – 11:00 AM. If students are unable to attend it due to schedule conflicts, email the course instructor (jasminechihabi@cunet.carleton.ca) to set up an appointment. Please note that office hours will not take place during holidays or Reading Week.

viii**. Student Science Success Center** (SSSC). This is a resource designed to aid undergraduate students in the Faculty of Science with all subject matters associated with the faculty. You can book an appointment through site https://sssc.carleton.ca

x. **Lectures & Tutorials**. Lectures will be held every week along with tutorials. Tutorials will be held during class time during which the instructor and student will be focused on problem solving.

xi. **Laboratory**. Details of the laboratory portions of this course can be found on the Brightspace site. **You must complete all activities of the laboratory portion to receive a passing group in this course.** Please note: Students have one to two weeks (see the lab schedule for due dates) to complete and submit their lab reports for each lab, and multiple submissions are permitted up until the due date. As a result, labs that are submitted late for any reason (including but not limited to electronic submission issues) will receive a mark of 0 for the lab. Therefore, you are encouraged to submit your lab report a day or two early, and update it if necessary, to ensure that you have no issues with your lab submission.

3. Learning Outcomes

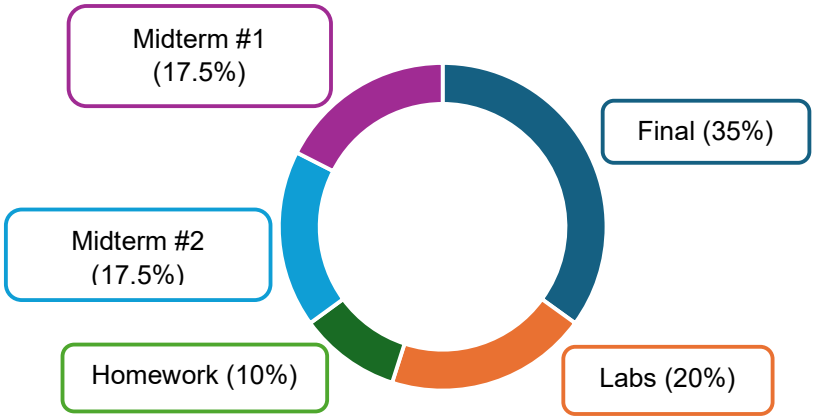
On successful completion of this course, students should be able to:

a. Demonstrate knowledge and understanding of atomic structure, periodic trends, Lewis structures, VSEPR and bonding.
b. Understand and apply the concepts of chemical equilibrium, especially in associating with acids, bases, salts, buffers, and titration curves.
c. Solve quantitative problems (stoichiometric) involving chemical formulas and equations which include solids, liquids, solutions, or gases.
d. Demonstrate knowledge and understanding of physical and chemical aspects of molecules and their reactions.
e. Perform laboratory experiments demonstrating safe and proper use of standard chemical glassware and equipment.
f. Record, graph, chart and interpret data obtained from experiments through working co-operatively with others or independently.

4. Evaluation

All online assessments are open book**. The work submitted must still be your own, and cannot be completed with the help of classmates, tutors, Chat GPT, AI, or online homework help (e.g. Chegg).** The final course grade will be calculated based on the following components. Please see "Lecture Schedule" for due dates.

Assessment	Weight
Mastering Chemistry Online Homework	10%
Laboratory	20%
Midterm I	17.5%
Midterm II	17.5%
Final Examination	35%



i. Online Homework (Mastering Chemistry):
Chemistry is not a subject that can be easily learned by simply reading a book. To consolidate your understanding, one must work with and use the concepts discussed in the course on a regular basis. Interactive homework is a way to keep up with the course and test your understanding. Access is purchased

either online or through the campus bookstores, and detailed instructions are provided on Brightspace. There are 6 assignments, one every two week. There are adaptive follow-ups which are generated immediately and available for a week. If an assignment is not attempted, a grade of zero is assigned.

ii. Midterm Examinations.
Midterm I and II comprise 35% of your final grade. The midterm exam will consist of a mixture of multiple choice and short and/or long answer questions. Midterm examinations have a maximum duration of 80 minutes.

iii. Final Examination. **Please see exam schedule from the Registrar's office.** The final examination covers the entire course and will be held **in person**.

5. Course Schedule

Week	Dates	Chapter	Notes, Deadlines, and Examination Dates
0	Sept 4	Syllabus; Independent Review	• Classes Begin.
1	Sept 9	Ch 1/ Ch 4	
2	Sept 16	Ch 4	• Sept 17th is last day for registration and course changes. • Mastering Chemistry Assignment #1 due on September 19th, 2024 at 11:59 PM
3	Sept 23	Ch 5	
4	Sept 30	Ch 6	• Mastering Chemistry Assignment #2 due on October 3rd, 2024 at 11:59 PM
5	Oct 7	Ch 7	• **Midterm I:** This week. Date/Time ***TBA***
6	Oct 14		• No class Monday due to Thanksgiving • Mastering Chemistry Assignment #3 due on October 17th, 2024 at 11:59 PM
Oct 21: No labs or classes			
7	Oct 28	Ch 8 and Ch 2	• Mastering Chemistry Assignment #4 due on November 7th, 2024 at 11:59 PM
8	Nov 4	Ch 14	•
9	Nov 11	Review	• **Midterm II:** This week. Date/Time ***TBA***
10	Nov 18	Ch 15	• Mastering Chemistry Assignment #5 due on November 21st, 2024 at 11:59 PM
11	Nov 25	Ch 16	
12	Dec 2	Review	• Dec 6: Monday schedule. • Mastering Chemistry Assignment #6 due on December 6th , 2024 at 11:59 PM

6. Policy on Missed 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/selfdeclaration.pdf) to Jasmine Chihabi (jasminechihabi@cunet.carleton.ca) within 48 hours of the missed work. For approved missed tests, the weight will be transferred to the final exam. 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.

7. Expectations

i. **Academic Integrity, Ethics and Etiquette:** It is expected that all members of the University community will uphold the values of academic integrity (https://carleton.ca/registrar/academic-integrity/) and interact with each other in a manner that is respectful, civil, and consistent with the responsibilities outlined in the Student Rights and Responsibilities policy (https://carleton.ca/studentaffairs/student-rights-and-responsibilities/). Inappropriate behaviour will not be tolerated, where examples include:

- Posting inflammatory messages about your instructor or fellow students,
- Using obscene or offensive language,
- Copying or presenting someone else's work as your own,
- Adapting information without using proper citations or references,
- Buying/selling lab reports or assignments,
- Posting or selling course materials to course notes websites,
- Recording lectures without the permission of the instructor,
- Having someone else complete your quiz or completing a quiz for/with another student,
- Stating false claims about lost quiz answers or other assignment submissions,
- Threatening or harassing a student or instructor,
- Discriminating against fellow students, instructors, and/or TAs,

Original work performed in good faith is assumed with all course components. Carleton University students have the responsibility of abiding by the University's policy on academic integrity, which prohibits several forms of academic offences, including cheating; falsification; plagiarism; unauthorized collaboration; or recording and/or dissemination of instructional content without express permission of the instructor.

Your graded submissions for online assignments, tests and exams should be your own, individual work. You may not share content from any assignments, tests, exams, etc. with 3rd-parties such as Chegg, CourseHero, Reddit, or any other content repositories. If found guilty of academic misconduct, a grade of zero is a common penalty on such course components, as well as a letter documented the offence being placed in your official student file.

It is also presumed that the data you collect, all data analysis and written/typed calculations and responses that you submit for grading are yours alone. We often find examples of plagiarism in which lab reports are copied from someone else, or from a previous semester. In short, if you have not done something yourself, do not attempt to pass it off as original work.

If you have any questions about what might cross the line, please do not hesitate to ask a TA or Instructor prior to submitting your work.

ii. Knowledge and Understanding: The pre-requisite for CHEM 1011 is high school chemistry (e.g., Ontario 3U and 4U or grade 11 and 12 chemistry) and enrollment in a chemistry major at Carleton University. In reviewing the course content of CHEM 1011 you may feel you know most of the material already. Don't be misled! The topics may be familiar, but we will provide a deeper understanding of the fundamental concepts within chemistry.

The purpose of CHEM 1011 is to build upon your previous exposure to the subject. You will need to move away from just memorization terms and definitions and spend more time thinking about the processes and concepts within chemistry. This will lay the foundation for more advanced courses such as analytical chemistry, biochemistry, organic chemistry, inorganic chemistry and physical chemistry. Note that the course is not designed to "teach" you chemistry. It is, however, constructed to help you learn chemistry.

b) *CHEM 1011 Detailed Course Topics and Learning Objectives* – the course can be subdivided into six sub-sections and the learning objectives for each are as follows:

1. Fundamental Concepts of Chemistry (**Chapter One**)
   This material is assumed from high school and is not covered in the course specifically. Review it if necessary.
   a. Atoms, Molecules, and Compounds
   b. Measurements in Chemistry

c. Chemical Problem Solving
d. Counting Atoms: The Mole
e. Amounts of Compounds
f. Aqueous Solutions
g. Writing Chemical Equations
h. The Stoichiometry of Chemical
i. Reactions
j. Yields of Chemical Reactions
k. The Limiting Reactant

2. Atoms and Light (**Chapter Four**) and Atomic Energies and Periodicity (**Chapter Five**)
    a. Understand the characteristics of atoms.
    b. Describe the properties of light and the interaction of light with atoms.
    c. Explain absorption and emission spectra.
    d. Understand the significance of the quantum numbers, understand how they can be used to code for the electron energy levels within atoms and know the shapes of the boundary surfaces of s, p, and d orbitals.
    e. Understand the organization of the periodic table in terms of the types of orbitals being filled; be able to apply the Pauli Exclusion Principle and Hund's Rule.
    f. Predict the magnetic behaviour of an atom or ion.
    g. Write ground-state electron configurations for any atom or ion using only the Periodic Table.
    h. Know periodic trends such as atomic dimensions and how atomic dimensions change as a function of position in the Periodic Table; compare the sizes of two atoms, two ions, or an atom and ion.
    i. Define ionization energy, electron affinity and electronegativity. Know how these parameters change as a function of position in the Periodic Table.

3. Fundamentals of Chemical Bonding (**Chapter Six**) and Theories of Chemical Bonding (**Chapter Seven**)
    a. Apply the Octet Rule to the construction of Lewis structures for multi-atom, multi-element molecules. Be able to recognize violations of the rule.
    b. Know what resonance is and be able to draw resonance structures.
    c. Show how formal charges can facilitate the generation of "better" Lewis structures.
    d. Apply VSEPR Theory to Lewis structures to determine approximate molecular geometries.
    e. Understand the significance of electronegativity and use it to identify polar bonds; use geometry to identify polar molecules.
    f. Understand the logic behind the need to invoke hybridization of atomic orbitals; use number of electron pair locations to determine hybridization used by the central atom.
    g. Describe single, double, or triple bonds in terms of the overlap of hybrid or pure atomic orbitals.
    h. Understand molecular orbital theory for diatomic molecules.
    i. Describe extended π-systems and band theory of solids.

4. Effects of Intermolecular Forces (**Chapter Eight**)
    a. Identify types of intermolecular forces present between molecule.
    b. Compare and contrast boiling points, melting points and water solubility based on intermolecular forces.
    c. Phase diagrams

5. The Behaviour of Gases (**Chapter Two**) and Principles of Chemical Equilibrium (**Chapter 14**)
    a. Understand the concept of pressure and how it relates to gas behaviour.
    b. Describe the characteristics of gases and understand gas laws.
    c. Perform gas stoichiometry calculations.
    d. Understand the molecular view of gases.
    e. Discuss properties of gas mixtures.
    f. Understand the behaviour of real gases.
    g. Describe the characteristics of dynamic equilibrium.

h. Connect the dependence of K on the way the balanced equation is written. What happens to K if the reaction is reversed?
i. Write a K expression for homogenous or heterogeneous equilibrium.
j. Relate K to extent of reaction, relative amount of reactant/product at equilibrium.
k. Relate Q value to direction of reaction, forward or reverse, to reach equilibrium.
l. Be able to solve an equilibrium problem.
m. Use Le Chatelier's principle to describe the effect of a stress on an equilibrium position, equilibrium constant K, concentrations, or pressures. Stresses include adding or removing a reagent, a temperature change, or a change in overall volume or pressure.

6. Aqueous Acid–Base Equilibria (**Chapter 15**) and Applications of Aqueous Equilibria (**Chapter 16**)
   a. Differentiate between the three definitions of acids and bases (i.e., Arrhenius, Brønsted-Lowry, and Lewis). Identify examples of each.
   b. Identify the six common strong acids.
   c. Identify strong bases (group I and II hydroxides and oxides).
   d. Identify conjugate acid/base pairs in an acid/base reaction.
   e. Write an equation for the auto-ionization of water and its K expression.
   f. Recognize strong acid and base aqueous solutions and determine the pH and equilibrium concentrations.
   g. Calculate pH from [H+] or [H+] from pH; relate [OH-] and [H+] using Kw.
   h. Recognize weak acids and weak bases, write an equation for the dissociation of an acid or base in water, identify the substances acting as the acid and base on either side.
   i. Write the equilibrium constant expression for a weak acid or weak base dissociation, determine pH and equilibrium concentrations.
   j. Relate Ka and Kb using Kw.
   k. Classify salts as producing neutral, acidic, or basic solutions in water; determine the pH of a salt solution.
   l. Recognize and determine the pH of buffer solutions; suggest a reasonable buffer solution to maintain a certain pH.
   m. Understand how and why an indicator changes color.
   n. Know the difference between equivalence point (or stoichiometric point), endpoint, and midpoint (or half equivalence/half stoichiometric point).
   o. Evaluate the reaction between a strong acid and strong base, a weak acid and strong base or a strong acid and weak base to determine the pH at various points including: (1) before the titration, (2) before the equivalence point, (3) at the equivalence point and (4) after the equivalence point.
   p. Write an equation for an acid/base reaction and determine the direction from acid/base strengths.

8. University Statements

a. **Academic Integrity**: The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes 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. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, art works, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

   Examples of plagiarism include, but are not limited to: any submission prepared in whole or in part, by someone else; using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment; using another’s data or research findings without appropriate acknowledgement; submitting a computer program developed in whole or in part by someone else, with or without modifications, as

one's own; and failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

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 or even suspension or expulsion from the University.

b. **Course Copyright**: Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copyright protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

   Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

c. **Final Grades**: Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

d. **Academic Accommodations**: Carleton University is committed to providing access to the educational experience to promote academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline)

e. **Addressing Human Rights Concerns**: The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca.

f. **Requests for Academic Accommodation**: You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

   Pregnancy obligation: Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the Student Guide to Academic Accommodation (PDF, 2.1 MB).

   Religious obligation: Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the Student Guide to Academic Accommodation (PDF, 2.1 MB).

   Academic Accommodations for Students with Disabilities: If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC

coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

Survivors of Sexual Violence: As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit the Equity and Inclusive Communities website.

Accommodation for Student Activities: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Senate Policy on Accommodation for Student Activities.

Academic Consideration for Short-term Incapacitation: "Short-term incapacitation" is illness, injury, or other extenuating circumstances beyond your control that can disrupt your ability to meet your academic obligations for five or fewer days. Depending on the circumstances, you may need to temporarily step away from your studies in order to take proper care of yourself.

If you are missing coursework or midterm work due to short-term incapacitation, you can contact your instructor(s) directly to request academic consideration. You are not required to submit a medical note if your absence lasts five or fewer days. If your instructor(s) requests that you provide supporting documentation, complete the self-declaration form. Instructors have the right to determine appropriate consideration at their discretion.

Scheduling and Examination Support: Scheduling and Examination Services provides various supports for both in-term and end-of-term tests and exams. Details can be found on the Exam Support website.