

General Chemistry 1 - CHEM 1001 A

Fall 2022

Instructor: Dave Brock

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.

Lectures

Lectures are pre-recorded and can be played back at any time.
You must keep up to date in your lecture watching!

“Tutorials”

“Tutorials” are in-person on Wednesday evenings (according to your Timetable). You are encouraged to participate – These “tutorial” times will be used to work on problem solving skills, answer concept polls, show connections and applications of the content to the real world, perform chemical demonstrations as well as carrying out topic discussions. Baring any technical issues, the tutorials are also recorded and can be played back at any time.

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, bundled with a two-term access code to WileyPlus, a homework management system you will be using.

This is the recommended package to buy.

If you buy a used book, or a discounted book elsewhere which does not include an access code, you can then buy access to WileyPlus alone at www.WileyPlus.com. Doing this gives you access to an electronic version of the book instead.

Grading

Component	Notes	#1	#2	#3	#4	#5	#6	#7	#8
WileyPlus	6 Online Homework Assignments	5	--	5	--	5	--	5	--
Reef Polling	Tutorial concept polls	5	5	--	--	5	5	--	--
Quizzes	Weekly Online Quizzes	10	10	10	10	10	10	10	10
Laboratory	Four experiments	20	20	20	20	20	20	20	20
Midterm	2 hours	25	25	25	25	12.5	12.5	12.5	12.5
Final Exam	3 hours	35	40	40	45	47.5	52.5	52.5	57.5

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 using the method that gives the highest grade.
2. All laboratory experiments **MUST** be completed and all lab reports **MUST** be submitted.

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

Online Homework Assignments

Problem assignments will be given regularly via WileyPlus (approximately one assignment every two weeks). It is your responsibility to check the answers and to take action if you have obviously not understood the latest material. **Those who neglect these assignments do not do well on tests and exams, where the stakes are much higher. Evidence from previous years shows that those who scored well on their homework assignments typically also scored well in the course.**

Reef Polling

Your mark on the tutorial concept polls for the course will be determined as follows:

Points for responding to a concept poll in class:	2 points
<u>Points for the correct response:</u>	<u>1 point</u>
Total points per question asked	3 points

Percent of total points earned:	80 or over	75-79	70-74	60-69	50-59	40-49	30-39	20-29	Under 20
Mark out of 5.0:	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	0

Please note that the threshold was set low to account for occasional absences or technical difficulties. As a result, adjustment to data will only take place if an absence *exceeds* one week of class and is accompanied by official accommodation.

Quizzes

There will be 12 timed quizzes (60 minutes per quiz), but only the best 10 will be used to calculate your mark on the Brightspace Quiz component of the course. If you receive academic accommodations, the remaining 10 quizzes will be counted.

Access to these timed quizzes starts on Monday at 12:00 am and closes on Tuesday at 11:55 pm. Quizzes will begin on Sept 12th and continue weekly for the rest of the term, with the exception of Fall Break (week of Oct 24th). Please see the course calendar for more details.

Laboratory

Details of the laboratory portions of this course can be found on the Brightspace site.

An important detail is that you must complete all activities of the laboratory portion to receive a passing grade 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.

Midterm Test

The midterm test will be scheduled by the Registrar's office and will take place on campus, outside of class time the week of Oct 31 (which can include Friday evening, Saturday or Sunday).

The P.A.S.S. Program

This course is associated with the Peer Assisted Study Sessions (PASS) program. In this program, weekly workshops are delivered by a facilitator. The facilitator is a student who recently took CHEM 1001 (and did very well). PASS is not a remedial program - it is intended for ALL students in the course. More details will be given in the first lecture or two.

Communicating With You

This is a big class, but you will find that you can get any help you need easily by one of the following methods:

1. If it is a course content related question, please post it to the Brightspace forum. Chances are if you have the question, your colleagues do as well and could benefit from the answer.
2. Visit an instructor in their office hour. I will post office hours in Brightspace at least one week in advance.
3. If it is an administration/accommodation related issue, email me directly (david.brock3@carleton.ca). Please note, if it is a course content related question, I will not be responding to it. Those questions should be directed to the Brightspace forum or office hours.
4. Your TAs, fellow students and other people on campus are also great resources and form a great study tool.

Special Arrangements

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 me 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, visit the Equity Services website.

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Religious obligation: Please contact me 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, visit the Equity Services website.

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

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 me 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 me as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

<https://carleton.ca/pmc/>

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:

<https://carleton.ca/sexual-violence-support/>

Accommodations 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 me 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 policy.

<https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

COVID: It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's [symptom reporting protocols](#).

Masks: Carleton has paused the [COVID-19 Mask Policy](#), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in [cuScreen](#) as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

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.

Research Activities

Please note that grade data from CHEM 1001 will be collected, used and disclosed by Sydney Buttera, PhD, Post-Doctoral Researcher in the Department of Chemistry. The purpose of the research is to compare grade data from CHEM Matters (CHEM 0999) to CHEM 1001/1002 to determine the effectiveness of CHEM Matters and identify opportunities for course delivery improvement. In order to complete this study, Sydney Buttera will be receiving and extracting of grade data from the Brightspace Learning Management System. **No personal identifiers will be used when reporting on the study.** If you do not wish for your grades to be used by Dr. Buttera, please communicate with her by email (sydney.buttera@carleton.ca) by September 30th, 2022.

Syllabus

1. Fundamental Concepts of Chemistry – this material is assumed from high school and is not covered in the course specifically.

Review it if necessary.

Atoms, Molecules, and Compounds
Measurements in Chemistry
Chemical Problem Solving
Counting Atoms: The Mole
Amounts of Compounds
Aqueous Solutions
Writing Chemical Equations
The Stoichiometry of Chemical Reactions
Yields of Chemical Reactions
The Limiting Reactant

4. Atoms and Light

Characteristics of Atoms
Characteristics of Light
Absorption and Emission Spectra
Properties of Electrons
Quantization and Quantum Numbers
Shapes of Atomic Orbitals

5. Atomic Energies and Periodicity

Orbital Energies
Structure of the Periodic Table
Electron Configurations
Periodicity of Atomic Properties
Energetics of Ionic Compounds
Ions and Chemical Periodicity

6. Fundamentals of Chemical Bonding

Overview of Bonding
Lewis Structures
Molecular Shapes: Tetrahedral Systems
Other Molecular Shapes
Properties of Covalent Bonds

7. Theories of Chemical Bonding

Localized Bonds
Hybridization of Atomic Orbitals
Multiple Bonds
Molecular Orbital Theory: Diatomic Molecules
Three-Centre π -Orbitals

Extended π Systems
Band Theory of Solids

8. Effects of Intermolecular Forces

Effects of Intermolecular Forces
Types of Intermolecular Forces
Liquids
Forces in Solids
Order in Solids
Phase Changes

2. The Behaviour of Gases

Pressure
Describing Gases
Gas Mixtures
Gas Stoichiometry
Molecular View of Gases
Additional Gas Properties
Non-Ideal (Real) Gases

14. Principles of Chemical Equilibrium

Describing Chemical Equilibria
Dynamic Equilibrium
The Equilibrium Constant
Reversibility
Properties of Equilibrium Constants
Concentration Units and Activities
Pure Liquids, Pure Solids, and Solvents
Direction of a Reaction at Equilibrium
Magnitudes of Equilibrium Constants
Thermodynamics and Equilibrium
Free Energy and the Equilibrium Constant
Calculating K_{eq} from ΔG°
Equilibrium Constants and Temperature
Shifts in Equilibrium
Le Châtelier's Principle
Changes in Amounts of Reagents
Effect of Catalysts
Effect of Temperature
Working with Equilibria
Chemistry of Equilibria
Initial Conditions and Concentration Tables
Calculating Equilibrium Concentrations
Working with Small Equilibrium Constants
Working with Large Equilibrium Constants

Equilibria in Aqueous Solutions
Species in Solution
Types of Aqueous Equilibria
Identifying Types of Equilibria
Spectator Ions

15. Aqueous Acid–Base Equilibria

Proton Transfers in Water
Conjugate Acid–Base Pairs
Autohydrolysis of Water
Strong Acids
Strong Bases
The pH Scale
Weak Acids and Bases
Weak Acids: Proton Transfer to Water
Weak Bases: Proton Transfer from Water
Recognizing Acids and Bases
Oxoacids
Carboxylic Acids
Other Acids
Weak Bases
Acidic and Basic Salts
Salts of Weak Acids
Salts of Weak Bases
Summarizing Acids and Bases
Factors Affecting Acid Strength

Effect of Charge
Structural Factors
Multiple Equilibria
Polyprotic Acids
Salts of Polyprotic Acids

16. Applications of Aqueous Equilibria

Buffer Solutions
The Composition of Buffer Solutions
Molecular View of a Buffer Solution
The Buffer Equation
Buffer Action
Capacity and Preparation of Buffer Solutions
Buffer Capacity
Buffer Preparation
Acid–Base Titrations
Titration of a Weak Acid by OH⁻ Ions
Titration of a Weak Base with H₃O⁺ Ions
Titration of Polyprotic Acids
Indicators
Solubility Equilibria
Precipitation Equilibria
The Common-Ion Effect
Effects of pH

	Monday	Tuesday	Wednesday	Thursday	Friday
September					
	5	6	7 Classes Begin	8	9 <i>Practice Quiz Due 11:55 pm</i>
Ch 1 FSR	12	13 <i>Quiz 1 Due 11:55 pm</i>	14	15	16
Ch 4	19	20 <i>Quiz 2 Due 11:55 pm Last day for add/drop/swap</i>	21	22 <i>WileyPlus Assignment #1 Due 11:55 pm</i>	23
Ch 5	26	27 <i>Quiz 3 Due 11:55 pm</i>	28	29 <i>Last day to withdraw</i>	30
October					
Ch 6	3	4 <i>Quiz 4 Due 11:55 pm</i>	5	6 <i>WileyPlus Assignment #2 due 11:55 pm</i>	7
Ch 7	10 Thanksgiving	11 <i>Quiz 5 Due 11:55 pm</i>	12	13	14
Ch 8	17	18 <i>Quiz 6 Due 11:55 pm</i>	19	20 <i>WileyPlus Assignment #3 due 11:55 pm</i>	21
No Labs or Classes	24 Fall Break	25 Fall Break	26 Fall Break	27 Fall Break	28 Fall Break
November					
Review	31	1 <i>Quiz 7 Due 11:55 pm</i>	2	3	4 Midterm this week (date/time TBA)
Ch 2	7	8 <i>Quiz 8 Due 11:55 pm</i>	9	10 <i>WileyPlus Assignment #4 due 11:55 pm</i>	11
Ch 14	14	15 <i>Quiz 9 Due 11:55 pm</i>	16	17	18
Ch 15	21	22 <i>Quiz 10 Due 11:55 pm</i>	23	24 <i>WileyPlus Assignment #5 due 11:55 pm</i>	25
December					
Ch 16	28	29 <i>Quiz 11 Due 11:55 pm</i>	30	1	2
Review	5	6 <i>Quiz 12 Due 11:55 pm</i>	7	8 <i>WileyPlus Assignment #6 due 11:55 pm</i>	9 Classes End