

CHEM 1201: General Chemistry for Engineers 1 Fall 2025

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Class Meeting Times/Dates/Location: M/W/F 10:10 AM – 11:00 AM in room CHEM 140

Course Communication:

Canvas will be used for class problems, reading quizzes, grades, recorded lecture material, and other class info. You can also access screencasts from there. You are responsible for all the information that is posted there. Most routine administrative questions should go to the course email: chen1201@colorado.edu. Email is not a good way to clarify questions on the material; those questions should be answered in office hours or recitation.

Office Hours: Please refer to Canvas for weekly office hour times and links.

Textbook and Other Required Materials:

- **Textbook:** Mastering Chemistry for Tro, *Chemistry: A Molecular Approach 6th ed.*, Pearson, 2023. (Available as "CU Book Access" through Canvas site, see posted instructions for access)
- This class utilizes the iClicker system to enhance learning and reward participation in class discussions. I have posted detailed instructions for getting set up with your iClicker to the course Canvas site, so please read through these carefully to make sure you are registered and set up. **Given wifi constraints in CHEM140, it is strongly recommended that you purchase a physical clicker to avoid connection issues.** Student iClicker remotes are [available for purchase from the CU Book Store](#).
- A non-programmable calculator. These are the simple, \$15 calculators that just do addition, subtraction, multiplication, exponents, etc. Please bring them to class and **exam**.

Course Description:

General Chemistry for Engineers 1 is designed to meet the general chemistry requirement for many engineering students and serve as part one for students whose academic plans require advanced work in chemistry. A basic knowledge of chemistry is important for understanding how the processes and materials used throughout all fields of engineering work. The intent of this course is to provide an introduction to the structures, properties, and fundamental concepts in chemistry. This course will also teach engineering students how to do problem-solving with chemical concepts and provide a chemistry knowledge base of concepts and experimental techniques that they can carry forward into their future engineering careers. Topics include components of matter, stoichiometry, electron configuration, chemical bonding, molecular shapes, covalent bonding, classes of reactions, thermochemistry, gases, atomic structure, organic compounds, intermolecular forces, and phase equilibria. Examples and problems illustrate the application of chemistry to engineering sub-disciplines.

Course Learning Goals:

1. Master basic mathematical skills and fundamental chemical concepts.
2. Understand the connection between macroscopic observations, molecular views, and symbolic representations in chemistry.
3. Recognize the relationship between molecular structure and chemical and physical properties.
4. Understand the basis of and effectively use the periodic table.
5. Analyze complex chemical problems, develop critical thinking skills, and logical approaches to problem solving.
6. Draw and interpret graphs and analyze data in class, in recitation, and on exams.
7. View chemistry as an integrated and logical science.
8. Recognize and explain how chemistry concepts apply to everyday phenomena.
9. Take personal responsibility for learning and develop/enhance self-regulated learning skills.
10. Articulate an understanding of science and develop communication skills.
11. Understand in sufficient depth for later coursework:
12. The Periodic Table and Atomic Structure
 - a. Understand the concepts of the electromagnetic spectrum (the nature of light), atomic spectra, and the quantum mechanical model of the atom.
 - b. Be able to apply the Pauli Exclusion Principle to the determination of orbital energies and electron configurations.
 - c. Be familiar with the trends of the Periodic Table, and be able to relate these trends to chemical behavior such as bonding and the properties of matter.
13. Atoms and Molecules
 - a. Understand the fundamental concepts of the atom, including atomic number, mass number, atomic symbols and atomic masses.
 - b. Be able to discuss ions and their properties.
 - c. Understand the nature of compounds, their formulas and their bonding. Be able to identify and name binary covalent and ionic compounds.
 - d. Be able to discuss inorganic and organic chemical systems, and identify their similarities and differences.

14. Molecules, Moles, and Chemical Equations

- a. Be able to write and balance chemical reactions.
- b. Understand aqueous solutions, solvents and solutes. Be able to write and balance chemical equations for aqueous reactions, including acid-base and redox reactions.
- c. Be able to interpret chemical equations, specifically to determine empirical and molecular formulas using moles and molar masses.

15. Stoichiometry

- a. Be able to obtain chemical ratios from a balanced chemical reaction.
- b. Be able to determine limiting reactants, theoretical and percentage yields and solution stoichiometry.

16. Chemical Bonding and Molecular Structure

- a. Be able to identify and describe ionic and covalent type bonding; understand the similarities and differences between the two types of bonding.
- b. Be familiar with the concepts of electronegativity, bond polarity, and the use of Lewis structures in predicting chemical structure.
- c. Be familiar with the model of orbital overlap in chemical bonding, and the use of hybrid orbitals to predict molecular shape.

17. Thermochemistry

- a. Be able to define energy, its forms and the units of energy.
- b. Understand and apply the concepts of heat capacity, calorimetry, and enthalpy.
- c. Be able to apply Hess's Law to the interpretation and prediction of enthalpies of reactions.
- d. Be able to define and use the laws of thermodynamics in characterizing thermochemical reactions.
- e. Be able to use Gibbs Free energy to characterize reaction spontaneity

18. State of Matter: Gases

- a. Be able to correlate structure with bonding and rationalize the resulting properties.
- b. Understand the concepts of pressure, partial pressure, and ideal versus real gases.
- c. Be able to apply the ideal gas law to chemical reactions involving gases.
- d. Understand the postulates of the kinetic-molecular theory of gases and its limitations.

19. States of Matter: Liquid, Solids and Phase Equilibria

- a. Be able to compare and contrast gases, liquids and solids in terms of bonding, structure and properties.
- b. Be able to describe bonding in solids, including models for metallic bonding.
- c. Be able to describe the structures of simple crystalline solids
- d. Understand the difference between types of solids: conductors, semiconductors and insulators.
- e. Be familiar with the types of intermolecular forces.
- f. Be familiar with the physical properties of liquids, including vapor pressure, boiling point, and surface tension.
- g. Be able to interpret simple phase diagrams.
- h. Be able to apply the Clausius-Clapeyron equation to changes in phase.

Class Format:

This class will be taught partly as a “flipped classroom.” In other words, much of the direct communication of material will be done outside class through screencasts and reading. Classroom time will be spent on mostly conceptual questions and problem solving. In order for you to benefit from this approach:

- a) Reading assignments and screencasts will be assigned for every class. The class will be conducted with the assumption that you have read/watched them.
- b) There will be reading quizzes due on M/W/F and homework problems due T/Th for most weeks. Both quizzes and homework will be due by 10:00 am the day they are due.
- c) Class templates for each class, which include the problems that will be solved in class, will be posted on-line. Please look through these before joining class so you are prepared to follow the content.

Grading:

Generally, this class follows a standard grading scheme:

90 – 100	A-/A
80 – 89	B-/B/B+
70 – 79	C-/C/C+
60 – 69	D-/D/D+
< 60	F

This could change depending on the overall class average at the end of the semester. However, you will not get a grade that is worse than stated above. Exams are not curved. **NOTE:** I do not round scores up – If you earn an 89.99% then this is a B+ and NOT an A-! Your work in the course = your grade.

The grade elements are as follows:

Recitation	10%
Homework	15%
On-line reading quizzes	5%
Clickers	5%
Midterm Exam 1	15%
Midterm Exam 2	15%
Midterm Exam 3	15%
Final Exam	20%
Total:	100%

Exams:

As a course policy, ***the lowest midterm score may be dropped and replaced with your final exam score if this improves your overall grade.*** If a midterm is missed due to illness or other emergency, this will automatically be the dropped exam when determining final grades for the course. No make-up exams will be given. The intent of this policy is to provide an opportunity for showing improvement throughout the course as well as a "second chance" to overcome a poor score (including a zero due to a missed exam) on one of the midterms. Note that the final exam will be cumulative and thus serve as a gage of your overall understanding of the material from the course. All exams are closed books – any necessary information will be provided.

Exam Dates:

EXAM 1	Tuesday, September 30 th 6:00 – 7:30 pm	CHEM140, CHEM142
EXAM 2	Tuesday, October 28 th 6:00 – 7:30 pm	CHEM140, CHEM142
EXAM 3	Tuesday, December 2 nd 6:00 – 7:30 pm	CHEM140, CHEM142
FINAL EXAM	Friday, December 12 th 10:30am – 1:00 pm	Loc: TBD

Homework:

All homework will be on-line problems through Mastering Chemistry which can be accessed directly through Canvas. Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. Homework is due twice a week on Tuesdays and Thursdays except for exam weeks. Your three lowest homework grades will be dropped. During sign up or throughout the term, if you have any technical problems or grading issues, please contact <https://support.pearson.com/getsupport/s/contactsupport> explaining the issue. This support team is almost always faster and better able to resolve technical issues than your instructor or TA.

Recitations:

Every student is required to attend their scheduled weekly recitation. The recitations will cover concepts and problems in more detail than can be done in class. You are welcome to suggest topics if you would like. The top ten recitation grades will be counted.

These sessions are held in order to clarify material presented both in class and in the homework or reading quizzes. You are already assigned to a recitation. Please only attend the recitation you are assigned to as there are strict room occupancy restrictions. **Recitation will start on week 2.** Please bring a calculator.

Recitation points are based on attendance (70%) and participation (30%). Participation will be measured at the TA's discretion, determined by asking questions, being engaged in the class (i.e. arriving on time, not checking phones, etc.), and will be measured over the entire semester.

The ten highest recitation scores will be counted. However, it is suggested that you attend all the recitations as the information you gain from them is very useful. Remember that recitation is worth 10% of your overall grade. Please make sure you come prepared!

On-line reading quizzes:

There are 3 reading quizzes a week (due MWF) accessed through Canvas. These are based on the assigned reading and screencasts and are due at 10:00am. Please do not ask to reopen a quiz because you forgot, you missed the deadline, your computer wasn't working, etc. as they will be made available well in advance of the submission deadline. The lowest two quizzes will be dropped; no other quizzes will be dropped for anything other than a medical or emergency reasons.

Clicker Questions:

During each class, I will ask clicker questions which will count 5% towards your overall grade at the end of the semester. You must be in class to get credit for clicker questions. Please see the document posted on Canvas for more information on how to register your clicker. The lowest 3 clicker days will be dropped.

Academic Dishonesty:

Academic dishonesty of any sort as described on the CU Boulder Honor Code <https://www.colorado.edu/osccr/honor-code> and repeated below is **grounds for failure of the course**.

Academic Dishonesty: Any act in which a student gains, or attempts to gain, an unfair academic advantage over other students.

These acts may include, but are not limited to:

- i. **Plagiarism:** Portrayal of another's work or ideas as one's own
- ii. **Cheating:** Using prohibited notes or study aids, allowing another party to do one's work/exam and turning in that work/exam as one's own, copying another student's course work, and collaborating on course work when prohibited
- iii. **Fabrication:** Falsification or creation of data, research, or resources, altering a graded work without the prior consent of the course instructor
- iv. **Lying:** Deliberate falsification with the intent to deceive in written or verbal form as applied to an academic submission

- v. **Bribery:** Providing, offering, or taking rewards in exchange for a grade, or, an assignment, or in the aid of Academic Dishonesty
- vi. **Threat:** An attempt to intimidate a student, staff, or faculty member for the purpose of receiving an unearned grade or in an effort to prevent the reporting of an Honor Code violation, or in connection with any other form of Academic Dishonesty
- vii. **Unauthorized Access:** Gaining unauthorized access to protected academic information including, but not limited to: the Integrated Student Information System (ISIS); a faculty member's computer, files, and/or office; or secure information on an online server
- viii. **Clicker Fraud:** Using, or having someone else use, clicker technology fraudulently in an effort to receive academic credit.
- ix. **Resubmission:** Submitting the same or similar work in more than one course without permission from all course instructors involved
- x. **Aiding Academic Dishonesty:** Intentionally facilitating any act which may help a student to gain an unfair academic advantage including, but not limited to, any of the aforementioned acts.

UNIVERSITY POLICIES

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the [Honor Code](#). Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. Understanding the course's syllabus is a vital part in adhering to the Honor Code.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the [Honor Code](#) will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit [Honor Code](#) for more information on the academic integrity policy.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or DSinfo@colorado.edu for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

If you have a temporary illness, injury or required medical isolation for which you require adjustment, please reach out to me directly via email so that we can discuss an appropriate supportive path forward.

Accommodation for Religious Obligations

Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please communicate the need for a religious accommodation in a timely manner. In this class, please reach out to me directly via email so that we can discuss a suitable accommodation. See the [campus policy regarding religious observances](#) for full details.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Classroom Behavior

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, marital status, political affiliation, or political philosophy.

For more information, see the [classroom behavior policy](#), the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits [protected-class](#) discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email CUreport@colorado.edu. Information about university policies, [reporting options](#), and [OIEC support resources](#) including confidential services can be found on the [OIEC website](#).

Please know that faculty and graduate instructors are required to inform OIEC when they are made aware of incidents related to these concerns regardless of when or where something occurred. This is to ensure that individuals impacted receive outreach from OIEC about their options and support resources. To learn more about reporting and support for a variety of concerns, visit the [Don't Ignore It page](#).

Mental Health and Wellness

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact [Counseling and Psychiatric Services \(CAPS\)](#) located in C4C or call (303) 492-2277, 24/7.

Free and unlimited telehealth is also available through [Academic Live Care](#). The Academic Live Care site also provides information about additional wellness services on campus that are available to students.