

Chemical Principles II

Last Updated: Mon, 07/28/2025

Course prefix: CHEM

Course number: 1212K

Section: HP

CRN (you may add up to five):
90009

Instructor First Name: Carrie

Instructor Last Name: Shepler

Semester: Fall

Academic year: 2025

Course description:

This course is the second of a two-semester sequence that introduces the foundational concepts of chemistry. General topics covered include chemical equilibrium, kinetics, electrochemistry, coordination chemistry, and the driving forces for inorganic reactions. The course is designed for science and select engineering majors. Laboratory exercises supplement the lecture material.

Course learning outcomes:

Lecture

- *Apply* concepts of chemical kinetics to predict amounts related to chemical reactions.
- *Qualify and quantify* the relationships between temperature, molecular collision, and rate of chemical reaction.
- *Relate* the concepts of chemical equilibria to rate of chemical reaction.
- *Interpret* equilibrium data regarding chemical reactions.
- *Apply* the concepts of LeChatelier's principle to chemical and biological systems.
- *Compare/contrast* the concepts of the three theories of acids and bases and *apply* them to inorganic and biological systems.
- *Apply* concepts of chemical buffers to chemical and biological systems.
- *Apply* titrations to determine information about chemical systems.
- *Apply* concepts of electrochemistry to generation of voltage and energy systems
- *Integrate* the concepts of equilibrium, Gibbs free energy, and cell potential.
- *Predict and explain* the colors and magnetic properties of transition metal coordination compounds using crystal field theory.
- *Apply* concepts of isomerism to coordination compounds.

- *Explain* the electrophilic and nucleophilic behavior of compounds.
- *Compare* allotropes of carbon.
- *Explain* the reactions of binary hydrides and acidic, basic, and amphoteric oxides.

Laboratory

- *Ask scientific questions* about chemical phenomena, variable relationships, and/or substances.
- *Plan and/or carry out chemical investigations* based on scientific research questions.
- *Analyze and interpret chemical data* and observations with respect to a specific research question(s).
- *Develop and/or use models* of chemical phenomena to explain results or predict observations.
- *Use mathematical and computational thinking* to analyze, evaluate, and/or model results of chemical experiments.
- *Generate explanations* for experimental observations or phenomena based on chemical theory.
- *Argue from evidence* derived from chemical experiments to draw reasonable conclusions about scientific research questions.
- *Obtain, evaluate, and communicate information* about chemical phenomena, experimental results, and/or theory.
- *Integrate and apply the concepts from lecture* with observations and measurements made in the laboratory.
- *Identify the hazards and risks* associated with a chemistry laboratory experiment.
- *Learn to use chemical techniques* and standard equipment properly.
- Recognize the value of *maintaining a laboratory notebook* and apply sound note-taking practices.
- Develop skills in *written and oral scientific communication*.
- *Practice teamwork skills* through collaboration and communication during chemical investigations.

Required course materials:

1. *Interactive General Chemistry 2.0*, Macmillan Learning
This is an interactive e-book that includes access to Achieve, the online homework platform, as well as iClicker, the mobile polling system. You may purchase an access code via the Barnes and Noble bookstore (it is printed on a card) *or* through the Macmillan Learning link in Canvas. **The cost should be \$40 for one semester access. If you see a different price listed, then please inform me before purchasing.**
2. *Labflow Complete*: Online account subscription, lab coat, and safety glasses.
3. *Laboratory notebook*. You should have a dedicated notebook for recording data and observations during lab demonstrations and simulations. It does not need to make

duplicate pages as you write.

4. *Microsoft Office suite*. You will need access to Word, Excel, and PowerPoint for this course. All can be downloaded free of charge for GT students through [OIT](#)
5. Access to Canvas is required.

Grading policy:

Course Requirements & Grading

Exam 1	11% or 110 points
Exam 2	11% or 110 points
Exam 3	11% or 110 points
Final Exam	22.5% or 225 points
Daily Work ¹	22% or 220 points
Laboratory.	22.5% or 225 points
Total ²	100% or 1000 points

1. Daily work consists of online homework, pre-lecture quizzes, in-class problem solving, and learning reflections. See below for additional details.
2. *Students earning below 60% in the laboratory component of the course (less than 135 of 225 points) OR below 60% in the lecture component of the course (less than 465 of 775 points) will receive an F for the semester and will be required to repeat both the lecture and the laboratory components of the course, regardless of their final total points.*

Your final grade will be assigned as a letter grade according to the following scale:

A	90.0 – 100%	900—1000 points
B	80.0 – 89.9%	800—899 points
C	70.0 – 79.9%	700—799 points
D	60.0 – 69.9%	600—699 points
F	Less than 60.0%	less than 600 points
OR Less than a 60% in laboratory OR less than 60% in lecture		

Attendance policy:

Attendance is **required** for laboratory sessions and lecture exams. Attendance for all other class periods is strongly recommended.

Comprehensive guidelines regarding class attendance and excused absences (for laboratory sessions and exams) can be found in the Georgia Tech catalog. Please read through the policies in their entirety.

<http://www.catalog.gatech.edu/rules/4/>

<http://www.catalog.gatech.edu/policies/student-absence-regulations/>

Guideline summary: Application primarily to exams and laboratories in CHEM

1212K:

You are permitted to miss an exam for Institute approved absences (illness, religious observance, athletics, etc.) You should inform me via email as soon as you know of a conflict so that we can arrange for you to take the exam at an alternate time.

If you miss an exam due to illness, then you should email me (Dr. Shepler) as soon as you know you will miss or have missed an exam. You may be asked to contact the Dean of Students depending on the situation and duration of the illness.

Students may miss exams due to personal emergencies. Please also email me (Dr. Shepler) as soon as you know you will miss or have missed an exam due to personal emergency.

You must contact me (Dr. Shepler) ***immediately if you miss an exam without an excused absence (as outlined above).***

Students who are absent because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs the course instructors of the upcoming absence, in writing, within the first two weeks of class, and provided that the student makes up the missed material within the time frame established by the course instructors. This also applies to exams.

Laboratory absences should be coordinated with the laboratory instructor.

Academic honesty/integrity statement:

Students are expected to maintain the highest standards of academic integrity. All work submitted must be original and properly cited. Plagiarism, cheating, or any form of academic dishonesty will result in immediate consequences as outlined in the university's academic integrity policy.

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit:

<http://www.catalog.gatech.edu/policies/honor-code/> or
<http://www.catalog.gatech.edu/rules/18/>.

If you have question involving the Academic Honor Code at any time during the semester, then please contact your instructors or other first-year program faculty member. We are happy to clarify policies and help you navigate your academic experience with integrity.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Each exam will list academic integrity guidelines (these also will be posted prior to each exam). Each exam will include an honor code statement that all students must confirm or

deny.

Core IMPACTS statement(s) (if applicable):

This is a Core IMPACTS course that is part of the STEM area.

Core IMPACTS refers to the core curriculum, which provides students with essential knowledge in foundational academic areas. This course will help students master course content, and support students' broad academic and career goals.

This course should direct students toward a broad Orienting Question:

- How do I ask scientific questions or use data, mathematics, or technology to understand the universe?

Completion of this course should enable students to meet the following Learning Outcome:

- Students will use the scientific method and laboratory procedures or mathematical and computational methods to analyze data, solve problems, and explain natural phenomena.

Course content, activities and exercises in this course should help students develop the following Career-Ready Competencies:

- Inquiry and Analysis
- Problem-Solving
- Teamwork