CHEM 1211 Laboratory Syllabus

Chemical Principles I Laboratory *Georgia Tech | Fall 2026*

Instructor Information

Instructor	*Email*	*Office Location & Hours*
Dr. Deborah Santos	deborah.santos@chemistry.gatech.edu	See Course Information Page (Canvas)
Teaching Assistant	See TA and Section Information Page (Canvas)	

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 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

General Information

Description

Chemical Principles I Laboratory is an introductory chemistry laboratory that focuses on analytical and synthetic chemistry. The course is designed to develop your experimental skills and technical writing skills as you collect evidence for the concepts, principles, and theoretical models discussed in lecture. In lab work is aimed at developing transferable data analysis, modeling, and scientific explanation and argumentation skills. Technical writing and presentation will be significant parts of this course. Lecture-related content topics addressed in experiments will include stoichiometry, gases, thermochemistry, quantum theory of the atom, Lewis structures, and intermolecular interactions. Developing comfort and accuracy when handling chemicals are important psychomotor goals of the course. Investing in CHEM 1211 laboratory will help you walk into advanced chemistry lab courses and research laboratories with confidence!

Expectations and Goals

This is a ***residential*** course involving weekly in-person experiments. Each week, you will complete an experiment with a lab partner and conduct results analysis with multiple other students. It is an expectation that you will attend all experiments and sufficient attendance is required to pass the course. Attendance is also necessary to complete notebook pages and post-lab assignments.

Learning Outcomes

- 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.
- Make connections between chemistry concepts and sustainability principles in real-world applications.
- Develop skills in written and oral scientific communication.
- Practice teamwork skills through collaboration and communication during chemical investigations.

Course Materials

Required Materials

- Labflow Complete: online account subscription, lab coat, and safety glasses.
- Composition notebook. For recording data and observations in the laboratory. This notebook does not need to make copies as you write.
- All assignments, protocols, and other documents will be distributed through Labflow and the CHEM 1211 Laboratory Canvas site. Turning on Canvas notifications is strongly recommended, so that you receive a weekly announcement describing what laboratory will look like in the week ahead. Experimental protocols should be printed from Labflow and brought to the lab.

Lab Attendance and Absences

Labs meet in a room on the fifth floor of Clough Commons and ***lab attendance is mandatory***. Please consult your class schedule for the time and location of your lab section. To earn credit for assignments related to an experiment, it is necessary to attend and collect your own data; using another students' data without attending lab is prohibited.

Consult with Dr. Santos prior to a planned absence from lab and set up a meeting with the Office of Student Life if applicable (see below). Excused absences include:

- Participation in athletics sanctioned by Georgia Tech.
- Cases in which the Office of Student Life issues an excused absence. These are issued for emergencies such as injury, illness, or death in the family. After your appointment with their office, they will contact your instructors to arrange accommodations. Please note that any absence due to illness must be accompanied by an email from the Dean of Students indicating that you have met with them and that they suggest excusing your absence.
- Religious observances.
- Absences sanctioned by the Student Academic and Financial Affairs Committee (SAFAC). Contact the committee at least three weeks prior to a planned absence.

Obtaining an excused absence from Dr. Santos will allow for provisional data to be granted through Labflow so that a makeup of the experiment is possible.

Tardiness Policy. Students who arrive more than 15 minutes after the scheduled start of the lab period (in person) will be turned away and will not be allowed to perform the experiment in a different section. If you anticipate a recurring situation that will cause you to be late to your lab period, please inform your teaching assistant at the start of the semester. Please note that pre-lab assignments are due at the start of your lab period, will be unavailable after this time, and must be completed to submit remaining assignments in each experiment module. No laboratory work will be accepted after Dec 4, 2026.

Accommodations through the Office of Disability Services. If you have accommodations through ODS, please meet with Dr. Santos in the first two weeks of the semester to discuss how your accommodations intersect with the course.

Course Schedule

Week	Topic	Exercises
Week 1 (Aug 24-28)	Lab Orientation Day	**Set up Labflow Account** **Introduction to Laboratory** **Lab Safety 101** **Pre-Semester Survey** **Take Pre-Assessment**
Week 2 (Aug 31-Sep 4)	**1 Rainbow in a Test Tube**	**Pre-lab quiz 1** **Data Entry 1**
Week 3 (Sep 7-11)	No Lab – Labor Day Holiday	**Lab Submission 1**
Week 4 (Sep 14-18)	**2 Precision, Accuracy, and Precipitation Reactions**	**Pre-lab quiz 2** **Data Entry 2**
Week 5 (Sep 21-25)	**3 Chromatography and Spectroscopy Dye Analysis**	**Lab Submission 2** **Pre-lab quiz 3** **Data Entry 3**
Week 6 (Sep 28-Oct 2)	**4 Stoichiometry of a Hydrate**	**Lab Submission 3** **Pre-lab quiz 4** **Data Entry 4**
Week 7 (Oct 5-9)	**5 Calorimetry of Metals ONLY W/R Classes (Fall Break M/T)**	**Lab Submission 4** **Pre-lab quiz 5 (W/R)**

Week	Topic	Exercises
		Data Entry 5 (W/R)
Week 8 (Oct 12-16)	**6 Synthesis of Acetaminophen**	**Lab Submission 5 (W/R)** **Pre-lab quiz 6** **Data Entry 6**
Week 9 (Oct 19-23)	**7 Exploring Gas Laws**	**Lab Submission 6** **Pre-lab quiz 7** **Data Entry 7**
Week 10 (Oct 26-30)	**8 Quantum Mechanics**	**Lab Submission 7** **Pre-lab quiz 8** **Data Entry 8**
Week 11 (Nov 2-6)	**9 Gas Chromatography of Fruit Esters**	**Lab Submission 8** **Pre-lab quiz 9** **Data Entry 9**
Week 12 (Nov 9-13)	**10 Computational Chemistry**	**Lab Submission 9** **Pre-lab quiz 10** **Data Entry 10** **Post-semester survey**
Week 13 (Nov 16-20)	**11 Intermolecular Forces**	**Lab Submission 10** **Pre-lab quiz 11** **Data Entry 11**
Week 14 (Nov 23-27)	**5 Calorimetry of Metals ONLY M/T Classes (W/R Thanksgiving Break)**	**Lab Submission 11** **Pre-lab quiz 5 (M/T)** **Data Entry 5 (M/T)**
Week 15 (Nov 24-28)	**Presentations, Cleanup, & Checkout**	**Lab Submission 5 (M/T)** **Poster Presentation** **Peer Evaluations** **Post-Assessment**

Assignments

1. *Lab Safety 101*. Safety is absolutely essential in chemical laboratory work. Lab Safety 101 is the basic lab safety training offered by Georgia Tech Environmental Health and Safety. It will introduce you to essential policies and procedures related to safety that apply to research and teaching laboratories across the Institute. This assignment is mandatory.
2. *Introduction to Laboratory*. This assignment will introduce you to course logistics, Microsoft Excel, basic measurement theory, laboratory reports, and fundamental chemistry concepts.
3. *Pre-lab Assignments*. Knowing what you're doing in the lab and why you're doing it helps you be safe and efficient. Before lab, read the protocol and complete the pre-lab assignment built into Labflow (due at the start of lab). A completed pre-lab (80% minimum score) is required to gain access to Lab Submission assignments. This requirement will be enforced using Labflow.

4. *Certified Reagent Operations (CROs).* Developing familiarity and skill with foundational laboratory techniques is an important learning goal of CHEM 1211 laboratory. CROs are designed to recognize and reward accurate and precise technique. There are two roles to every CRO: operator and observer. The operator performs a chemical handling or measuring technique aiming for accuracy and precision (guidelines are available in technique tutorial videos in the CRO module in Labflow). The observer verifies that the operator's technique is in fact accurate and precise. Provided the operation is completed successfully, both operator and observer earn points. CROs should be completed naturally in the course of experiments; a very large number of opportunities will be available. Completion of techniques in the course will earn tokens.
5. *Data Entry and Notebook Pages.* Data, observations, and conceptual activities will be recorded on laboratory notebook pages during experiments. At the end of each lab session, scan and upload your notebook pages to the Labflow Lab Submission assignment. Use an app such as Genius Scan to scan and convert to PDF format. Concept Checks and Group Argumentation are in-lab conceptual activities that will be completed in your notebook pages. At the end of lab, you will proceed past the "Data Entry" portion of the Lab Submission assignment.
6. *Lab Submission and Post-lab Assignments.* Instructions for post-lab assignments for each experiment will be provided on Labflow in the Calculations and Report section of the Lab Submission. Post-lab assignments will be submitted through Labflow at the bottom of the Lab Submission assignment. Post-lab assignments will focus on the development of robust technical writing, scientific argumentation, and data visualization skills. Post-labs are due the evening of your lab the following week at 11:59 pm.

Grading Scheme and Policies

Laboratory represents 22.5% of your overall course grade (225 points of 1000). ***You must achieve a 60% in lab (pass at least 6 experiments out of the total 11) to pass the course as a whole***. The Lab Safety 101 and Introduction to Laboratory assignments are mandatory. Tokens will be available through completion of pre-lab videos, CROs, and surveys to gain access to lab resubmission as another opportunity to demonstrate mastery through a reattempt. To pass a lab, 4 out of 5 general specifications must be met. Each assignment contains rubrics with guidelines for what must be present to meet each specification and ultimately earn a passing grade of 1/1.

General Specifications for Lab Submission (must meet 4/5 to earn a "pass" grade)

1. Represents their own work accurately
2. Appropriately displays data and results
3. Calculations and analyses are mostly correct process (>70%)
4. Presents an argument about the research question that is logically consistent with experimental results
5. Connects target concepts to experimental results to evaluate their quality

<table>
<tr><td>Pre-labs
11 pre-labs (earn lab submission access)</td><td>Certified Reagent Operations
5 CROs (operator or observer) (earn token)</td></tr>
<tr><td rowspan="2">Other Assignments
Introduction to Laboratory (mandatory)
Lab Safety 101 (mandatory)
Pre-semester survey (earn token)
Post-semester survey (earn token)
Cleanup and checkout (mandatory)</td><td>Lab Submission Assignments
11 notebook pages
11 post-labs (pass/no pass)</td></tr>
<tr><td>Science Practice Skills Assessments
Pre assessment (completion score)
Post assessment (graded)</td></tr>
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9 Resubmissions (optional, for necessary revisions)	

TOTAL The number of passed experiments will be used to determine your Laboratory points toward your overall CHEM 1211 course grade according to the following breakdown:

Letter Grade Equivalent	Points Toward 1212K Grade (out of 1000)	Number of passed labs (out of 11)	Score Thresholds on Science Practice Assessments (average)
A+	225 points	10	<90%
A-	215 points	9	80-89%
B	199 points	8	70-79%
C	174 points	7	60-69%
D	149 points	6	50-59%
F	0 points	<6	<50%

Token System.

This course has a token system that will allow you to purchase extensions on pre-labs, lab submissions, and resubmissions. Tokens are earned for positive course contributions, such as watching pre-lab videos, completing CRO assignments, completing surveys, etc. You may also request a token for attending office hours. If you miss a lab due to an undocumented circumstance, you may use a one-time request for provisional data in exchange for 5 tokens. This is manually managed via the absence request form under the Absence link in Canvas under the Course Resources module. In the Token Dashboard in Labflow, you can view your balance, available items for purchase, and opportunities to earn tokens. This system is intended to incentivize positive actions and provide flexibility for life to happen (exams, traffic, missed alarm, etc.).

Late Work.

Assignments submitted on Labflow after published due dates will be considered late. A penalty of 100% will apply after the due date, but submissions are allowed up to 7 days. After 7 days, post-lab assignments will NOT be accepted. If you submit an assignment late, email your teaching assistant to notify them to provide feedback on your work, but it will not be allowed to earn a passing score. A token redemption will be allowed for a resubmission using the TA's feedback as necessary. Note: Pre-labs cannot be completed late without a valid excuse from Dr. Santos. No laboratory work will be accepted after Dec 4th, 2026.

Regrade Policy.

Your TA grades your work based on rubrics and keys provided by the First-year Chemistry faculty. If you have questions about why something was graded a certain way or what you can do to improve your scores, talk with your TA first. You may submit a formal regrade request to your TA if you have a specific grievance. Re-grade requests must be submitted in writing or via email within 7 days of the grade being posted to Canvas. To submit a regrade request, either (a) attach a written description of your concern to your lab report and give it to your TA or (b) send an email to your TA with specific information about why you believe the initial grading was incorrect. First-year Chemistry faculty should be contacted only if you and your TA cannot reach a mutually agreeable decision. At meetings to discuss regrades with faculty, both the student and TA must be present.

Academic Integrity, Collaboration, and AI Usage Policy.

Although you will work with a lab group to complete experiments, all work for the laboratory must be prepared wholly by you. This means you must create your own data tables, plots, sample calculations, and text. The content of your post-lab assignments must be based solely on what appears in your lab notebook. Copying and pasting figures, tables, or text constitutes plagiarism and is a violation of the Georgia Tech Honor Code.

You are welcome to work with other students while completing assignments for lab, and your peers can be excellent resources for learning. However, to properly assess your learning and provide you with feedback that allows you to enrich yourself, work that you call yours must be produced wholly by you. You may not copy the work of another student or resource and *represent it as your own*. ***Additionally, sending any part of any work that you intend to turn in to another student is strictly prohibited.*** Sending and receiving work that will be turned in for grading are violations of the Honor Code of Georgia Tech and serious breaches of academic integrity.

Artificial intelligence (AI) can be a useful tool for learning and/or improving your writing, however, it should not serve as a substitute for your own understanding of the results of your experiments. Assignment submissions containing AI-generated text will be considered a violation of academic integrity for the purposes of First-year Chemistry laboratory courses. Any written work you submit should be original writing created by you alone. The use of AI to revise and/or improve your original writing in submitted assignments should be disclosed and cited for transparency.

TAs are bound by the Honor Code to notify the First-year Chemistry faculty of suspected plagiarism of laboratory work. If you are concerned about potential plagiarism associated with your work, please consult your teaching assistant before turning it in. Honor Code violations will initially be addressed by the faculty of the First-year Chemistry Program and will only be referred to the Office of Student Integrity if a mutual agreement is not reached. For more information, please see the Georgia Tech Academic Honor Code.

Laboratory Safety Policies.

1. Proper attire is required in lab at all times. Anyone lacking appropriate dress is forbidden from entering the lab. Proper attire includes:
    a. Close-toed shoes and socks covering the entire foot.
    b. Long pants covering the entire leg. Capris are never in fashion in the chemistry lab. While standing, no skin may be exposed below the waist.
    c. A 100% cotton lab coat.
    d. Safety glasses or goggles. Eye protection must be donned immediately upon beginning work in the lab and may not be removed until you walk out the door.
2. Gloves must be worn in the laboratory throughout the duration of the day's experiment. Replace gloves that have become excessively sweaty or dirty—using many gloves is OK!
    a. Gloves should be donned just before beginning the day's experiment.
    b. To avoid contaminating us poor saps who work in Clough (and for other good reasons), gloves must be removed upon leaving the lab.
3. Eating, drinking, and smoking are prohibited in the laboratory. The only thing entering one's body during the laboratory period should be a 78:21 mixture of $N_2(g)$ and $O_2(g)$.
4. Cell phones may not be used in the laboratory, except in specific circumstances at the discretion of the teaching assistant. Consult your TA prior to using a cell phone (including the use of apps) in the laboratory. Gloves must be removed prior to using a cell phone.
5. At the end of the lab period, lab areas should be left clean (i.e., as they were when lab began). Hands should be washed before leaving the lab.
6. Waste must be placed in appropriate containers. If you are in doubt about where to put a substance, ask the teaching assistant or lab coordinator.

7. Please do not hesitate to report safety-related incidents to your teaching assistant, including minor spills. Promoting a culture of safety is everyone's responsibility and should come with no shame or stigma. We report significant safety incidents to the School of Chemistry and Biochemistry Safety Committee and Georgia Tech Environmental Health and Safety not to punish those involved, but to catalyze a conversation about how future incidents can be avoided.