

CHEM 1310 Laboratory Syllabus

General Chemistry for Engineers Laboratory

Georgia Tech | Fall 2023

Instructor Information

Instructor	Email	Office Location & Hours
Dr. Deborah Santos	Dsantos47@gatech.edu	Scheduled by Appointment Location: Teams

Teaching Assistants	Email	Section	Lab Time / Location
TBD		A01	M 12:30 / 589
TBD		A02	T 12:30 / 589
TBD		A03	W 12:30 / 589
TBD		A04	R 12:30 / 589
TBD		A06	M 3:30 / 589
TBD		A07	T 3:30 / 589
TBD		A08	W 3:30 / 589
TBD		A09	R 3:30 / 589
TBD		A12	T 8:00 / 581
TBD		A14	R 8:00 / 581
TBD		A32	T 8:00 / 589
TBD		A34	R 8:00 / 587

TBD		A44	R 8:00 / 589
TBD		G02	T 12:30 / 587
TBD		G04	R 12:30 / 587
TBD		G06	M 3:30 / 587
TBD		G07	T 3:30 / 587
TBD		G08	W 3:30 / 587
TBD		G09	R 3:30 / 587
TBD		G12	T 8:00 / 587
TBD		L01	M 12:30 / 581
TBD		L02	T 12:30 / 581
TBD		L03	T 12:30 / 581
TBD		L04	R 12:30 / 581
TBD		L06	M 3:30 / 581
TBD		L07	T 3:30 / 581
TBD		L08	W 3:30 / 581
TBD		L09	R 3:30 / 581
TBD		L21	M 12:30 / 587
TBD		L23	W 12:30 / 587

General Information

Description

General Chemistry Laboratory is an introductory chemistry laboratory that focuses on foundational physical and analytical chemistry. While you will develop some technical skills with handling and measuring chemicals, much of the 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 fundamentals of measurement, quantum theory of the atom, stoichiometry, Lewis structures, intermolecular interactions, chemical thermodynamics, kinetics, and equilibrium. Developing comfort and accuracy when handling chemicals are important psychomotor goals of the course. Investing in CHEM 1310 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.

Course Materials

Required Materials

- Lab coat, 100% cotton.
- Safety glasses. You are welcome to use either safety glasses or goggles for all experiments.
- 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 the CHEM 1310 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 and any CRO forms needed should be printed from Canvas 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.

Excused absences will be removed from calculation of your lab grade so that they do not count against you. Your lab grade will be calculated out of 30 fewer points and your next lowest experiment score will be dropped.

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 1, 2023.

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 21-25)	No Lab - Add/Drop Period	Introduction to Laboratory Lab Safety 101 Pre-Semester Survey
Week 2 (Aug 28-Sep 1)	1 Precision, Accuracy, and Precipitation Reactions	Pre-lab quiz 1 Notebook Pages 1
Week 3 (Sep 4-8)	No Lab - Labor Day Holiday Monday	Post-lab 1
Week 4 (Sep 11-15)	2 Solution Preparation and Visible Spectroscopy	Pre-lab quiz 2 Notebook Pages 2
Week 5 (Sep 18-22)	3 Stoichiometric Characterization	Pre-lab quiz 3 Notebook Pages 3 Post-lab 2
Week 6 (Sep 25-29)	4 Calorimetry	Pre-lab quiz 4 Notebook Pages 4 Post-lab 3
Week 7 (Oct 2-6)	5 Gas Laws	Pre-lab quiz 5 Notebook Pages 5

Week	Topic	Exercises
		Post-lab 4
Week 8 (Oct 9-13)	6 Rainbow in a Test Tube (Wed/Thurs labs only!) Mon/Tues No Lab - Fall Break	Pre-lab quiz 6 Notebook Pages 6 Post-lab 5
Week 9 (Oct 16-20)	7 Quantum Mechanics	Pre-lab quiz 7 Notebook Pages 7 Post-lab 6
Week 10 (Oct 23-27)	8 Applications of Molecular Geometry	Pre-lab quiz 8 Notebook Pages 8 Post-lab 7
Week 11 (Oct 30-Nov 3)	9 Intermolecular Forces	Pre-lab quiz 9 Notebook Pages 9 Post-lab 8
Week 12 (Nov 6-10)	10 The Iodine Clock Reaction	Pre-lab quiz 10 Notebook Pages 10 Post-lab 9
Week 13 (Nov 13-17)	11 Measurement of K	Pre-lab quiz 11 Notebook Pages 11 Post-lab 10
Week 14 (Nov 20-24)	6 Rainbow in a Test Tube (Mon/Tues labs only!) Wed/Thurs No Lab - Thanksgiving Break	Pre-lab quiz 6 Notebook Pages 6
Week 15 (Nov 27-Dec 1)	12 Presentations, Cleanup, & Checkout	Mon/Tues labs Post-lab 6 Group Poster Canvas Poster Submission Peer Evaluations Post-semester survey

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.
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 Canvas (due Sunday nights). A completed pre-lab is required to receive credit for notebook pages and post-lab assignments. This requirement will be enforced using Canvas.
4. **Certified Reagent Operations (CROs).** Developing familiarity and skill with foundational laboratory techniques is an important learning goal of CHEM 1310 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 and Canvas pages). 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. Make steady progress to complete the number of CROs listed below by the end of the last lab period. You may complete a CRO for the same technique multiple times and do not need to complete every technique before the end of the term. Please refer to the Grading Scheme and Policies section for the CRO quota for this course; you are limited to a maximum of four (4) per experiment but do not need to submit one with every experiment. Points earned above and beyond the CRO quota will be discarded.
5. **Notebook Pages.** Data, observations, and conceptual activities will be recorded on laboratory notebook pages during experiments. After each lab session, scan and upload your notebook pages to the corresponding assignment in Canvas (due Thursday nights). Use an app such as Genius Scan to scan and convert to PDF format. Notebook pages will be graded according to a rubric available before each session. Concept Checks are in-lab conceptual activities that will be completed in (and graded with) your notebook pages.
6. **Post-lab Assignments.** Instructions for post-lab assignments for each experiment will be provided on Canvas and assignments will be submitted through Canvas. Post-lab assignments will focus on the development of robust technical writing, scientific argumentation, and data visualization skills. Post-labs are due the Friday night of the next week following the corresponding lab period (i.e. everyone will have more than a full week to prepare post-lab assignments after completing the experiment).

Grading Scheme and Policies

Laboratory represents 20% of your overall course grade (200 points of 1000). ***You must achieve a 60% in lab (120 points) to pass the course as a whole.*** Your lowest experiment score (the sum of pre-lab and post-lab scores for a single experiment) and notebook pages score will be dropped, even if they are due to an unexcused absence. The Lab Safety 101 and Introduction to Laboratory assignments cannot be dropped.

Pre-labs + Post-labs (200)

11 pre-labs (5 × 11)
 11 post-labs (15 × 11)
 *1 dropped (-20)

Certified Reagent Operations (40)

8 CROs (operator or observer) (5 × 8)

Other Assignments (60)

Introduction to Laboratory (15)
 Lab Safety 101 (15)
 pre-semester survey (10)

Notebook Pages (100)

11 notebook pages (10 × 11)
 *1 dropped (-10)

post-semester survey (10)

cleanup and checkout (10)

**The last lab cannot be dropped!* It is preferred that you attend all labs and let your lowest score be dropped rather than intentionally or accidentally skipping an experiment.

TOTAL (400) This total will be divided by 2 to determine your Laboratory points toward your overall CHEM 1310 course grade.

Late Work.

Assignments submitted on Canvas after published due dates will be considered late. A penalty of 10 percent per day will be assessed for each day that an assignment is late, up to 7 days. After 7 days, post-lab assignments will NOT be accepted. If you submit an assignment late that requires manual grading, email your teaching assistant to notify them. No laboratory work will be accepted after Dec 1, 2023.

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 and Collaboration Policy.

Although you will work with a lab partner 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 pre-labs and 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.

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.