

GEORGETOWN UNIVERSITY
Department of Chemistry
General Chemistry I - Summer 2020 - **Updated for Online Instruction**

General Information for CHEM 001 and CHEM 009

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Office Hours: by appointment	Office Hours: by appointment

Course structure: Lecture/Recitation MTWTh 8:10 - 11:25 AM (meet in same Zoom room)
Scheduled Quizzes MTWand/orTh 11:00-11:25 AM
Laboratory MTWTh 12:10 - 2:45 PM

Lab, Chem 009, is a separate course. Concurrent registration in Chem 001 and Chem 009 is required, except with permission from the instructor. The recitation portion of the lab course is used to support the lecture course and attendance to recitation is required for students in CHEM 001.

Due to the pandemic caused by Covid-19 both General Chemistry Lecture I and Lab I will offered online. Lecture, Recitation and Lab meetings will occur synchronously in Zoom. Please obtain all required items listed below for the first day of class. There is no lab manual required for CHEM 009, but some items are suggested.

The learning environment will be in Zoom meetings and the platform for providing links lectures, labs and office hours, lecture notes, assignments and submission of quizzes and tests is Canvas.

Required Items:

1. Please download the Zoom client on a laptop or computer equipped with a camera:

<https://georgetown.zoom.us/download>

2. Chemical Principles The Quest for Insight 7th Edition by Atkins, Jones, and Laverman (e-text is fine)

3. Online homework through Sapling Learning. [Link to student registration instructions](#)

The online homework is worth points toward your grade in the course and will be used for exams. Sapling works best with the Chrome browser on a laptop or desktop computer. Students have also successfully used tablets to do Sapling assignments and tests.

4. Scientific calculator. A phone app should not be used as a calculator and accounting calculators do not have the functions needed for chemistry.

Suggested Items:

1. HGS Molecular Structure Model Kit (about \$28-30 depending upon source). This will be

useful in lecture, specifically used in one lab and required for Organic Chemistry)

[Link to Amazon site for molecular model kit](#)

[Link to manufacturer site to purchase HGS Molecular Structure Model Kit](#)

2. Slinky. Yes, the toy! It is very helpful in demonstrating standing wave patterns. Get one if you would like to try it yourself. [Link to purchase original Slinky from Amazon](#)

A solution manual to the text is not required or suggested. Worked out solutions will be provided on Canvas.

What is this course all about?

CHEM 001 will emphasize both assigned reading/problem solving from the textbook and lecture material. Selected handouts will be provided as supplements to the textbook as required. An online homework program will be utilized to give you more practice answering questions and solving problems. It is understood that students will behave with the utmost respect for academic integrity in all aspects of this course.

Objectives: Every material thing around you, on this Earth and throughout the universe is made of atoms. Our main objectives in this course are to:

- Understand atomic structure and how this structure governs the characteristics of atoms as well as how and why atoms combine to form compounds.
- Understand the solid, liquid and gas phases, how they form and why.
- Understand what drives change (why do atoms rearrange to form new substances?)
- See connections between experiments, conclusions and explanations.
- Build analytical problem solving skills.
- Develop connections between mathematical problem solving and conceptual meaning.
- Begin the process of your transformation from a container of information to a contributor to human knowledge.

There are three main areas in science that provide the framework for answering questions about our material world: Quantum Mechanics, Thermodynamics and Kinetics.

Our goal is to develop your understanding and capabilities in quantum mechanics and thermodynamics and to introduce kinetics.

Examinations: There will be two exams during the semester and a cumulative final exam. All students are required to take the final exam. The dates for the exams are given on the schedule. There will be **no makeup exams** in this class. If missing an exam is absolutely unavoidable the final exam grade will also count as the missed exam grade. Students who do very poorly on one of their exams, but did not miss an exam, may substitute the final exam grade for the lowest exam grade. Exams will emphasize theory, conceptual understanding and problem solving: there will be multiple choice questions, short answer and problems wherein students are required to show their work.

Because of online instruction exams will be administered in a live Zoom meeting during regular class time as indicated on the syllabus. Students will scan written work and upload it to Canvas. The Sapling homework platform may be used for exams as well. Genius scan is an example of a free app that students can use on their phones to get pdfs of written work that can be uploaded to Canvas (also an app on the phone). We will practice this together in class so everyone is comfortable with the process.

Quizzes: Quizzes will be given as indicated on the schedule. Quizzes are very important in helping you gauge your success with the material, learn to work quickly and efficiently on problems, as well as encouraging good study habits. No quizzes will be given outside of scheduled class times, but the lowest quiz grade will be dropped so one missed quiz is not a problem. Quizzes will be challenging in order to properly prepare you for exams.

Because of online instruction quizzes will be administered in a live Zoom meeting at 11am as indicated on the syllabus. Quizzes will be given in two possible ways: a Canvas quiz or a document shown to students in Zoom, students write answers, convert to pdf and upload to Canvas.

Problem Sets (ungraded): *"It is much easier to find something if you seek it"*

Assigned problems from the text are selected to assist your learning and focus your reading. Please attempt the problems before lecture on that topic so you are exposed to what it is you need to know. My lectures are only meaningful to you if there is something in them you wish to know. If you have tried the problems in advance then you have some ideas about what to expect in class: this is what we mean by *"come to class prepared to learn"*. Do not arrive blank, ready to be written upon; arrive actively curious and hopefully lecture will be enlightening.

A word of caution: Do not be upset if you cannot immediately make sense of a problem, or you do not understand the answer to the problem. If you are struggling to solve a problem, your mind is working and you are learning ways to piece the information together. This is the actual value to you in taking this course; not the facts you assemble, but your method of learning new, complex ideas. If you rely too heavily on

looking up answers before you finish trying it yourself, you will gain a false sense of confidence with the material. It is important to struggle a bit with problem solving, to force yourself to find your own way. This doesn't happen immediately, in fact, we will be working on developing this skill all summer long!

Online Homework with Sapling Learning: These assignments will be worth credit toward your grade in the course. This work is meant to be a learning experience with immediate feedback. Your independent work is graded and recorded by the online program. Online homework is each student's independent work and collaboration is not acceptable. Sign up instructions are here: [Link to student registration instructions](#)

Homework due dates are listed in the Sapling site.

Attendance: It is most highly recommended that students attend all class meetings. Students are responsible for making up any missed work in either lecture or recitation on their own. Attendance in Zoom for Lab is mandatory. If a student is sick and must miss a lab, please contact Prof. Shahu to make an alternative arrangement.

All lectures, recitations and lab meetings will occur synchronously on Zoom. All meetings will be recorded and posted on Canvas (labs on the 009 Canvas site, lecture & recitation on the 001 Canvas site). Please do not allow yourself to get off track with our live meeting times. It is very important that you diligently keep to a rigorous schedule just as you would if we were meeting in person. The purpose of providing recordings is to give students yet another resource for review and learning and to also cover them in times of illness or family emergency. Please note that because we are completing a 15 week semester in just 5 weeks there is very little room to adjust for falling behind.

Laboratory: Students are expected to be prepared for each experiment. See the lab guidelines posted on Canvas for details. Technically the lab is a separate course, CHEM 009. The lab grade is therefore reported to the registrar separately from the lecture grade. All students registered for CHEM 001 must also be registered in CHEM 009 unless they are excused with permission from the instructor.

Grading: Chemistry can be a very difficult body of material to master and the last thing you need is the added pressure of competing with each other for grades. My goal is to enable each student to learn as much of the subject matter as they can master. Therefore, the grades will be determined by how the scores fit into a fixed grading system, not how they compare with other scores in the class. There will be no scaling of grades. Note that an A will represent significant achievement, a very difficult, but certainly not impossible accomplishment.

Assessments

Exam I	20 %
Exam II	20 %
Final exam	30 %
Quizzes	20 %
Online Homework	10 %

Given below are the expected ranges for final grades in the course. If your final average is in this range, you are guaranteed at least the grade indicated.

92.5 % and above	A
89.5-92.4	A-
87.5-89.4	B+
82.5-87.4	B
79.5-82.4	B-
77.5-79.4	C+
72.5-77.4	C
69.5-72.4	C-
67.5-69.4	D+
59.0-67.4	D
below 59 %	F

Feedback: Please feel free to call me at my office, or send me e-mail, any time if you have questions or if you need anything clarified. Obtaining a coherent knowledge of chemistry is one of the first steps toward your goal and I am here to help you in every way possible. So, please let me know how I may serve you best. Work hard and take advantage of all the resources available to you.

YOU ARE REMINDED OF THE PLEDGE YOU HAVE MADE:

In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Georgetown University Honor System: To be honest in any academic endeavor, and to conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.

GOOD LUCK !!! and **ENJOY !!!**

CHEM 009 General Chemistry Laboratory I
LABORATORY GUIDELINES – Updated for Online Instruction

BEFORE LAB - Pre Lab Assignment: Due no later than 11:59 PM the night before the Lab

1. Read the experiment.
2. Complete *all* of the pre-lab questions and write an outline of the lab procedure.
3. Submit your answers to all the pre-lab questions and your outline of the lab procedure to Canvas by 11:59 PM the night before the lab. Outlines and pre-lab must be done before lab therefore no credit will be given if the assignment is done during or after lab. They can also be done well in advance of the lab, so completing them early is not a problem.

DURING LAB

1. The Zoom meeting link can be found on the Canvas site under “Zoom Conferencing”. Meetings will be synchronous, but also recorded. Please arrive on time, at 12:10PM for each day there is a scheduled lab.
2. All 009 students (both sections) will be divided into 3 groups of 10-12 students that will meet with a TA in Zoom for lab.
3. The lab will begin with a PowerPoint presentation describing the theory, experiment and calculations. Since students will have already submitted the prelab questions and outlines, this will be a good opportunity for asking questions about the details. Students can also get feedback on prelab questions.
4. A video depicting the lab experiment will be shown.
5. Experimental data will be given to each pair of students. Each pair will go to a Zoom break out room to discuss and analyze their data. Lab partners will be rotated every week. This is an opportunity to get to know your colleagues as well as building teamwork skills.
6. Everyone will reconvene to discuss results, calculations and ask questions. We anticipate that most people will finish before the lab period ends at 2:45, but the TA will stay in the Zoom meeting room to meet with any student that returns with questions.
7. We highly encourage students to complete the lab in this setting, but students may leave and finish later.
8. **Reports are to be written in ink.** All data must be entered into the data sheet for the experiment. Do not obliterate errors, draw a single line through your error and continue on the same report sheet. (i.e. do not erase or scribble out mistakes, do not re-write report sheets, and do not write data on separate sheets of paper)

AFTER LAB

1. Certain questions at the end of each lab are to be completed and turned in with the lab report. See the lab schedule for these assignments. (Do not confuse this with completing all the pre-lab questions for your pre-lab assignment.)

2. Submitted reports must have all data and calculations. Answers to the questions, graphs, etc., are to be submitted with the corresponding lab report. Reports must consist of one file with all the required pages. **Each student submits their own lab report even though they worked in pairs.**

3. A formal lab report is required for two of the experiments, experiment 5 and 12. The formal report has the format of an American Chemical Society (ACS) journal article consisting of the following sections: Abstract, Introduction, Experimental Method, Results, Discussion, Conclusion and References. Details about the formal lab report format will be posted on Canvas and one lab period will be dedicated to discussion of this topic.

4. Each student will submit a reflection/concluding paragraph summarizing certain aspects of the lab with each lab report. These key topics are to be included in the reflection/conclusion paragraph.

- a) Re-state the purpose of the lab.
- b) Comment on what you learned from the lab experience.
- c) What specific tasks helped you learn a specific skill/concept?
- d) What specific lab techniques were learned?
- e) Comment on systematic and random experimental errors.
(Do not confuse this part with experimenter error.)
- f) If you repeated this lab what would you do differently?

Lab reports will be submitted on Canvas as a single pdf file. Scan Genius is a useful app for this purpose. Your phone can be used as a scanner to include all handwritten pages with the lab report.

Lab reports are due no later than 11:59 PM according to the due dates on the syllabus. A 5-point deduction will be assessed for each report submitted after 12am. A 10-point deduction will be assessed if the report is a day late. Each subsequent day will cost the lab score 15 points. Lab reports will not be accepted more than 3 days late.

Experimental technique during lab is very important and this is something we cannot have you do yourself in CHEM 009. Techniques will be demonstrated via video. To make up for this shortcoming in teaching lab online there will be a strong emphasis on error analysis, data analysis and graphing, experimental design and technical writing.

The lab report grade will depend upon the accurate presentation of data graphically. All graphs must be done in Excel. You must, title every graph and all axes must be properly labeled and scaled. If you are unsure how to correctly present your graphical data, please ask! It is all part of your learning process. Read "CHEM 009 Grading" for important information concerning your evaluation in this course.

HAVE FUN! We hope it is possible for you to enjoy the online lab environment. We hope to make it collaborative, conversational and illustrative of techniques. Think about what the experiment is designed to prove and observe closely how the data was collected in the video. Ask questions!

Academic Honesty: ALL STUDENTS ARE EXPECTED TO EXERCISE HONESTY IN THEIR WORK. YOU ARE REMINDED OF THE PLEDGE YOU HAVE MADE:

In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Georgetown University Honor System: To be honest in any academic endeavor, and to conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.

Some examples of dishonest behavior to be rigorously avoided: changing data in lab reports, copying data from another student's lab report, not contributing to the group on team projects, printing several copies of the same graph, introduction or conclusion and sharing amongst the group, allowing your partner to analyze all the data, having one group do half the lab while another group does the other half and then sharing the results. These are actions that I would not expect of any student, but I have observed them in the past. Plan well and be organized so you do not fall into unethical behavior in an attempt to keep up with your course work.

Summary of Grading Criteria in General Chemistry Laboratory I – Updated for Online Instruction

The goal for the assessment of students in General Chemistry Lab is to maintain an environment that is both fair and academically challenging. As the first lab course taken by science majors, Chem 009 plays an important role in exposing students to the experimental nature of chemistry. Because of the pandemic caused by Covid-19 we find ourselves in a new situation: online lab courses. While you do not get to collect data yourself we will create an environment designed to teach you the experimental nature of chemistry wherein you can learn about how experiments are done and their limitations. An important learning goal will be your ability to understand error and error analysis in experiments.

The lab work is assessed based on:

1. Student preparedness for experiments.....10%
2. Engagement and participation in lab lessons.....10%
3. Complete experiments and lab reports.....65%
4. Reflection/Conclusion paragraphs.....15%

1. Preparedness is evaluated based on the submission of an outline of the lab procedure and completed pre-lab questions. There is a deduction on your lab report of 10 points if the outline of the lab is not done. Sometimes, certain pre-lab questions are graded.

2. Engagement and participation means that students actively work to analyze the data. Arriving on time and not missing swaths of the lab are also important. An accommodation can be made for this component if a student must make up the lab at a different time.

3. The criteria for grading each lab report will be determined after you have done the lab. Each lab is different, so points are assigned to emphasize different aspects of the lab. Each lab emphasizes different skills, e.g. problem solving, graphing, unknown determination, etc. Some labs have extensive calculations and problems to solve, so most of the credit is associated with doing these problems correctly.

All original lab data will be provided. Data must be written into the report sheet in ink and then treated as if it was data collected by the student. Original data must be submitted with every report. Do not rewrite lab data. Do not erase your work as you proceed with the lab.

The lab report grade also depends upon the accurate presentation of data graphically. **All graphs must be presented in Excel.** You must **title every graph and all axes must be properly labeled** and scaled. An Excel tutorial is posted on Canvas for additional assistance.

Students working as a pair in the lab share data because they acquire the data together. This is perfectly reasonable. All other data sharing is dishonest. The data you receive will be genuine experimental data and therefore different results are expected from one group to another. While we would always expect students to get good data, there is not a penalty for poor results. If you believe your results are in error, you are encouraged to write an explanatory note to show your understanding of the situation and possible sources of error.

4. Along with each lab report each student will submit a reflection/concluding paragraph summarizing certain aspects of the lab:

- a) Re-state the purpose of the lab.
- b) Comment on what you learned from the lab experience.
- c) What specific tasks helped you learn a specific skill/concept?
- d) What specific lab techniques were learned?
- e) Comment on systematic and random experimental errors.
(Do not confuse this part with experimenter error.)
- f) If you repeated this lab what would you do differently?

Given below are the ranges for the final grades in the course. If your average is in this range, you will get at least the letter grade indicated.

92.5 % and above	A
89.5-92.4	A-
87.5-89.4	B+
82.5-87.4	B
79.5-82.4	B-
77.5-79.4	C+
72.5-77.4	C
69.5-72.4	C-
67.5-69.4	D+
59.0-67.4	D
below 59 %	F

Course Schedule for CHEM 001-10 Summer 2020

Date		Topic	Chapter
1Jun	Mon	Introduction to CHEM 001 Focus 1: Atoms How is the structure of an atom investigated? Millikan Oil Drop Experiment, Rutherford Gold Foil Experiment, Electromagnetic Radiation, Atomic Spectra	1A
2Jun	Tue	Introduction to Quantum Mechanics What are wave functions? Particle in a Box Model	1B-C
3Jun	Wed	Hydrogen-like Atomic Orbitals, Quantum Numbers Quiz 1	1D
4Jun	Thu	Electron Configurations, Periodic Table, Periodicity Quiz 2	1E-1F
8Jun	Mon	Review and discuss topics on Exam 1 Quiz 3	1A-1F
9Jun	Tue	Exam 1 (1A-1E) Naming Compounds	F29-F37
10Jun	Wed	Focus 2: Molecules Ionic vs. Molecular Compounds Molecules: Covalent Bonding and Lewis Structures	2A-2D
11Jun	Thu	What determines the shapes of molecules? VSEPR Theory	2E-2F

		Valence Bond Theory and Hybrid Orbitals Quiz 4	
15Jun	Mon	Molecular Orbital Theory	2G
16Jun	Tue	Focus 3: States of Matter How is a gas recognized? How are its physical properties described quantitatively? Quiz 5	3A-3C
17Jun	Wed	Kinetic Molecular Theory and Real Gases Quiz 6	3D-3E
18Jun	Thu	Intermolecular Forces and Properties of Liquids	3F-3G
22Jun	Mon	Review and discuss topics on Exam 2 Quiz 7	1F, 2A-2G, 3A-3G
23Jun	Tue	Exam 2 (1F, 2A-2G, 3A-3G) How are atoms arranged in solids?	3H
24Jun	Wed	Crystalline Solids, Unit Cells, Calculations Focus 4: Thermodynamics Introduction: Heat and work	3H, 4A-4B
25Jun	Thu	Enthalpy, Thermochemistry, Calorimetry, Hess's Law	4C-4E
29Jun	Mon	Entropy Quiz 8	4F-4H

30Jun	Tue	Gibbs Free Energy Quiz 9	4I-J
1Jul	Wed	Review, catch up, practice, prepare for final exam	
2Jul	Thu	Final Exam 8:15 am – 11:15 am	Cumulative

Course Schedule for CHEM 009-10/11 Summer 2020
Updated for Online Instruction

Date	Exp #	Topic <i>All Due Dates are for submission on Canvas no later than 11:59 PM</i>	Post-Lab Questions
1 Jun	No lab manual required. All info posted on Canvas	Laboratory Safety & SDS (Due 6/1) Intro to Experimental Error, Statistics and Graphing	
2 Jun	1	Lab safety quiz (P/F) Calibration of Glassware (Due 6/03)	Complete Worksheet
3 Jun	2 3	Atomic spectra (Due 6/07) Design a Procedure (Due 6/03)	5&7 & 1-4
4 Jun	4	How Many Waters of Hydration in Epsom Salt? (Due 6/09)	Complete Worksheet
8 Jun		No Lab	
9 Jun		No Lab	
10 Jun	5	Determining the Concentration of a Solution: Beer's Law (Due 6/14)	Formal Report
11 Jun		Introducing the Annotated Lab Report Writing Guide	
15 Jun	6	Conjugated Dyes PIB Model (Due 6/16)	Complete Worksheet
16 Jun	7	Lewis Structures and VSEPR Model (Due 6/17)	1-6
17 Jun	8	Properties of Gases (Due 6/18)	1-3
18 Jun	9	Molar Mass of a Vapor (Due 6/22)	1-9
22 Jun	10	Intermolecular Forces (Due 6/24)	Complete Worksheet
23 Jun		No Lab	
24 Jun	11	Structure of Solids (Due 7/28)	Complete Worksheet
25 Jun	12	Enthalpy of a Chemical Reaction (Due 6/30)	Formal Report
29 Jun		No Lab	
30 Jun		No Lab	
1 Jul		No Lab	
2 Jul		No Lab	