

Chemistry 1B General Chemistry

CHEM 1B - Section 25

Lab MW – 11:30AM to 2:20PM – SC2204

Lecture TR – 4:30PM to 5:45PM – SC32

CHEM 1B - Section 26

Lab TR – 11:30AM to 2:20PM – SC2204

Lecture TR – 4:30PM to 5:45PM – SC32

Instructor: Dr. Chris Deming, email: demingchristopher@fhda.edu

Office Hours: Mondays/Wednesday 4:00 PM – 5:30 PM through Zoom. Thursdays 3:00 PM – 4:00 PM SC1226. The link for zoom office hours can be found below as well as on CANVAS under pages.

<https://fhda-edu.zoom.us/j/86894978084?pwd=eEZ1dmc4TGNaSVVNdmw0OFRFdmFOdz09>

Course Description: This class will cover the principals of chemical kinetics, intermolecular forces, gases, chemical equilibrium, weak acids/bases, and thermodynamics.

This course is divided into two separate instructional periods, the lecture and laboratory sections. The lecture portion is primarily devoted to the material discussion while the laboratory portion gives a chance for chemical experimentation. One registration code will enroll for the lecture and lab sections. Lecture and lab sections must be taken together to pass Chem 1B and will both go towards a single grade.

Course Material:

- 1. Primary Lecture Text:** OPEN STAX Chemistry, Second Edition. This is a free, online textbook and we will follow chapters 9, 10, 12-14, and 16 in this course.
- 2. Aktiv Online Homework Platform:** This quarter, we will use the online platform Aktiv for homework. A subscription to Aktiv is available through the online de Anza bookstore, and I will further discuss how to subscribe to and utilize this platform on the first day of class.
- 3. Supplementary Lecture Text:** CHEMISTRY: The Molecular Nature of Matter and Change, Silberberg and Amateis. Any edition will work. While this option will cost money, this is a quality textbook and could be a great reference for the future.

4. Supplementary Calculation Practice: Calculations in Chemistry. While homework problems will be assigned through Aktiv and sometimes extra worksheets, more practice is always a good idea, and this book can give just that. It can be found as a hard copy or digital through the De Anza bookstore.

5. Lab Equipment: There are a few things needed to safely complete the experiments.

- a. Goggles are required for the entire lab, in addition to appropriate clothing for lab work, such as long pants and closed-toe shoes. The specifics of all the required safety gear will be discussed on the first day of lab and are described more in the lab safety sheet at the end of the syllabus.
- b. A lab notebook will also be needed. This notebook cannot be pocket size and must be permanently bound, so no recording information on loose papers. Other than that, the type doesn't matter, and digital notebooks are okay as well

6. Scientific Calculator. Logarithm and exponential functions required. You are encouraged to bring your calculator each day to work through examples as they are presented. Phones will not be allowed for calculations during tests.

7. Camera linked to the internet – For much of your classwork, you will need to take a picture of your work and submit to CANVAS. Phones are 100% okay. Please let me know if this is an issue as soon as possible.

Class Registration. Registration limit is strictly set at 30 per section since we are limited by the space in lab. The class will be filled based on the official roster provided by the De Anza Admissions and Records, including an official waitlist. Students on this waitlist may attend the lecture within the first two weeks but will not be allowed to come to lab until officially enrolled due to space restrictions. Since those on the waitlist will not be able to access the class canvas page, I will email lecture slides and assignments until registration is finalized at the end of the second week.

Resources: Academic support can be found at the Learning Resources Division <https://www.deanza.edu/learningresources/>. Information about tutoring can be found at the Math Science and Technology Resource Center <https://www.deanza.edu/studentsuccess/mstrc/>.

Academic Integrity: By enrolling in classes at De Anza College, you are agreeing to the academic integrity policy and are held to all standards. Specifics can be found at <https://www.deanza.edu/studenthandbook/academic-integrity.html>.

Cheating during an exam/quiz or copying/using work other than your own for assignments will result in a 0 for the entire assignment, regardless of what percentage of the work is from cheating.

Worse than a 0 on an exam, I am required to report such incidents to the disciplinary committee, who will make a note of the incident on your transcript, which then becomes visible to 4 year colleges upon reviewing your transfer application.

Disability Service Support: De Anza is committed to providing support for all students. Please contact me as soon as possible if you require special accommodations and I will be happy to do what I can to help. For more information, visit Disability Service Support at <https://www.deanza.edu/dss/>

Classroom Conduct: I want to be very clear that this class is a place where everyone can feel safe to be themselves and to learn at their own pace. It is important to me that you feel comfortable to ask questions, and I hope you all will help me create a supportive atmosphere.

Late Work Policy. Late prelabs are not accepted since preparation for safe lab work is mandatory. Other late work is accepted, but once an assignment has been graded, submissions of that assignment will be worth half credit maximum. If you anticipate not meeting a deadline for an assignment, please contact me and we can work together to make an alternate schedule.

Course Schedule. All exam dates, lecture topics/dates, lab topics/dates are listed on page 10. The final exam date is provided on page 10 and can also be found on the de Anza website.

Class Assignments:

Lecture Assignment	Points	Percent
Student Welcome Questionnaire	8.0	0.8
CHEM 1A Review Sheet	10.0	1.0
Homework	100.0	10.0
Gas Simulation Worksheet	25.0	2.5
Quiz 1	30.0	3.0
Quiz 2	30.0	3.0
Exam 1	100.0	10.0
Exam 2	100.0	10.0
Exam 3	100.0	10.0
Final Exam	120.0	12.0
Lecture Total	623.0	62.3

Class Total	1000.0	100.0
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Lab Assignment	Points	Percent
Chemical Lab Safety Sheet	6.0	0.6
Chemical Safety Certificate	6.0	0.6
Molar Volume of a Gas Prelab	6.0	0.6
Molar Volume of a Gas Lab Quiz	3.0	0.3
Molar Volume of a Gas Experimental Data	5.0	0.5
Molar Volume of a Gas Calculations and Questions	5.0	0.5
Molar Volume of a Gas Conclusion	5.0	0.5
Molecular Polarity Review Sheet	15.0	1.5
Vapor Pressure Prelab	6.0	0.6
Vapor Pressure Lab Quiz	3.0	0.3
Vapor Pressure Experimental Data	5.0	0.5
Vapor Pressure Worksheet	8.0	0.8
Green Crystals Prelab	8.0	0.8
Green Crystals Lab Quiz	3.0	0.3
Green Crystals Pipette Practice Worksheet	6.0	0.6
Green Crystals Experimental Data	8.0	0.8
Green Crystals Calculations and Questions	10.0	1.0
Green Crystals Conclusion	10.0	1.0
Kinetics Prelab	6.0	0.6
Kinetics Lab Quiz	3.0	0.3
Kinetics Experimental Data	5.0	0.5
Kinetics Formal Report	75.0	7.5
Kc by SPEC 20 Prelab	6.0	0.6
Kc by SPEC 20 Lab Quiz	3.0	0.3
Kc by SPEC 20 Experimental Data	5.0	0.5
Kc by SPEC 20 Calculations and Questions	5.0	0.5
Kc by SPEC 20 Conclusion	5.0	0.5
Ka/Kb Prelab	6.0	0.6
Ka/Kb Lab Quiz	3.0	0.3
Ka/Kb Experimental Data	5.0	0.5
Ka/Kb Calculations and Questions	5.0	0.5
Ka/Kb Conclusion	5.0	0.5
Calcium Hydroxide Prelab	6.0	0.6
Calcium Hydroxide Lab Quiz	3.0	0.3
Calcium Hydroxide Experimental Data	5.0	0.5
Calcium Hydroxide Worksheet	8.0	0.8
Lab Final	100.0	10.0
Lab Total	377.0	37.7

Lecture

Lecture Description

This class will cover chapters 9, 10, 12-14, and 16 from the assigned textbook. All lectures will be held in person from 4:30 PM to 5:45 PM on Tuesdays and Thursdays in room SC32. The power point lecture slides will be posted before the lecture on CANVAS under files.

My general philosophy toward lecture is that I am looking to give a deep description of the concepts as well as a thorough review of the associated mathematics. The marriage of these two independent ways of understanding is ultimate goal. This means I will spend a significant amount of time in lecture describing the atomic scale dynamics as well as going over calculations.

Below are some helpful tips that make learning much easier this quarter.

1. Review the material *before* attending the lecture. This review could include reading the section in the textbook, reviewing the lecture slides, or even glancing at the homework. This preview will help you develop a stronger and more personal connection to the topics and make the presented material easier to understand.

2. Don't only copy the words from the slides during lecture. Since I will post pdfs of the lecture slides before the lecture, you will not need to copy down everything on the presentation. Many of the slides are very dense with info, and it would take you too much time to copy all the words down.

Furiously copying the words on slides is not the best way to learn during a lecture, so instead, writing down what I am saying and/or what you are thinking will be a much more successful method.

This can be done with a tablet, printing out the slides before, or writing in a notebook using the slide numbers.

3. Complete all homework problems. Extensive practice is the best way to ensure concept mastery. The more you practice, the more comfortable you will be, and the better you will perform on exams. Beyond the minimum of the assigned problems, you are encouraged to use the calculation text book and do the extra Aktiv problems sets. I am serious when I say that I sometimes use homework questions on exams.

4. Don't fall behind. In chemistry, each new topic will build on the previous one so it is essential to understand the topics as they are presented. Following a lecture when you do not understand the previous material is not an effective method for learning and will lead to further problems. To avoid falling behind.....

5. Get help when you need it. If you are having a difficult time with a topic, it is your responsibility to get help. There are plenty of resources, including myself, for aiding in material comprehension. You are also encouraged to find a study group and/or come to office hours.

Lecture Assignments

Student Welcome Questionnaire. To become better acquainted with you and provide the best overall instructions possible, I have created a set of questions for you to answer, worth **8 points**. My idea is that with a strong relationship and mutual respect, communication and thus learning will be facilitated. I hope that knowing some of this info early on will help start building this relationship. The assignment will become available right when the canvas site opens. When you click on that assignment, you will find a pdf with the questions and further instructions.

CHEM 1A Review Sheet. To get a feeling of how comfortable you are with the prerequisite material, there will be a worksheet worth **10 points** that I will discuss during the first week of class. The goal for this assignment is not to take away points but rather to give a true assessment of your starting point so I can better teach as we go through the new chapters this quarter.

Homework. Homework assignments are worth 10% of the overall grade and are given through the online platform Aktiv. Scoring is on accuracy and overall completion. I will discuss how to subscribe to and utilize this platform on the first day of class.

Doing all the listed problems is highly recommended and represents the minimum needed to practice the topics. To give more practice, there will also be extra problem sets through Aktiv that will not be worth points but will provide extended practice. You are strongly encouraged to try these extra Aktiv problems and try others throughout the textbook and/or supplementary text.

Gas Simulation Worksheet. Gas Laws Worksheet. To further our understanding of gas behavior, we will use a program from PhET to simulate gases. This program is free and allows us to alter certain conditions of the gas and measure the effects. This program and the associated worksheet will be introduced in the second week, and the assignment is worth **25 points**.

Lecture Quizzes. Quizzes will be given between the exams to make sure everyone is keeping up with the material throughout the quarter. The quizzes are worth **30 points** each, will take about 25 minutes, and will be given during the beginning of the lecture. The days of the quizzes are given on page 10 and reminders will be sent through email

Lecture Exams. There will be three lecture exams throughout the quarter. Exams will cover material from lectures, homework, and book chapters. If you are having difficulty completing the homework questions for that chapter, you are urged to get help *before* taking the test. Questions will range from easy to difficult and may require solving problems that have not been explicitly demonstrated before. I will post a study topic guide before each exam.

Each exam is worth **100 points**, and the dates are given in on page 10. No late or early exams will be administered. If you feel the grading of any exam is incorrect, please let me know because I am happy to talk about it with you. I will release a key after the exam, and I am

very open to hearing what you have to say about the grading, but you must do so within **one week** of the day the exam key is released.

Lecture Final. The lecture final is worth **120 points** and will cover all chapters but will have more from the later chapters since there will not yet have been any testing on those chapters. The date and time for the final are given on page 10 and will not change.

Laboratory

While lab work is very exciting, it is important to be clear about the proper precautions for chemical hazards and how to complete lab assignments.

The chemical safety document can be found on the last page of the syllabus. I will go over this sheet in lab and you will read, sign, and turn it in to the CANVAS assignment before performing any experiments, worth **6 points**.

Additionally, there is an online module for lab safety that we will do the first week of lab and I will talk about it on the first day class. Completion of this module will give a chemical safety certificate and is worth **6 points**.

What follows below are descriptions of the policies and assignments required for each experiment

Absence Policy

If you are feeling sick before coming to lab, please, stay home. While you cannot make up the experiment due to time restrictions, there will be a way for you to make up the points so you won't lose any for staying home. We are all counting on each other to make responsible decisions and I don't want you coming to lab in fear of losing points if you are not well enough to do so. Just please let me know as soon as you can.

Lab Assignments

There are a total of 7 lab-based exercises this quarter that will loosely correspond to the topics we are covering in lecture. Depending on the lab, the assignments will slightly vary.

For five of the labs, which I will refer to as **full labs**, you will read the procedure, complete a prelab, take the lab quiz at the beginning of the lab period, attend the lab introduction before the experiment, perform the procedure, answer the follow-up questions/calculations, and write a conclusion.

For two of these, which I will call **half-labs**, the preparation and lab work will be the same as for full labs, but there will be an associated worksheet rather than a complete analysis and conclusion.

Instructions for Full Labs (Molar Volume of A Gas, Green Crystals, Kinetics, Kc by SPEC 20, and Ka/Kb)

Step 1: The first thing to do to prepare for the lab is to *read the entire experiment*. It is essential to become familiar with the experimental design and procedures before starting with the lab work, and this starts with a thorough read-through of the methods. The lab manuals will be available as pdfs on CANVAS under “files” as well as attached to the prelab assignment.

Step 2: Once you have familiarized yourself with the lab, the next step is to write a **prelab worth 6 points**. There are three parts to the prelab that are equally important.

The first part of the prelab is the **lab introduction**, where you will describe the goals of the experiment, introduce the scientific principles that form the basis of the study, and summarize the process by which you obtain the experimental data. This should not be a list of procedural steps but rather 1-3 paragraphs of writing in your own words.

The second part is a recognition of the **hazards** associated with each chemical in the procedure. This does not need to be everything on the SDS but should convey the hazards of working with that chemical and the proper precautions for safe usage.

The third part of the prelab is to write **tables** to hold the data you will collect. These can't be print outs of tables from the lab manual but should be something you make after reading the procedure and envisioning the data collection.

All parts of the prelab must be completed before coming to lab. Scan/take pictures of the work and upload them to the appropriate CANVAS assignment before the start time of the lab.

Step 3: At the *beginning* of the lab period, for the first day of each experiment, there will be a quiz to test how well the experimental design and procedural steps are understood, worth 3 points. These will only take about 10 minutes, and you can reference your prelab and lab notebook during the quiz.

Step 4: After the quiz, I will give an introduction at the beginning of the lab session that will typically include a discussion of the theory behind the experiment as well as a walkthrough of the harder aspects of the procedure. Missing this time may prevent you from performing the experiment that day since I may not be able to redo the intro while still watching over the class during the experiment.

Step 5: After performing the experiment, take a picture of your data (in the pre-made table) and load it to the appropriate assignment before leaving the lab room for **5 points**. You will not be graded on how accurate or precise your data are, but rather that all the trials are complete and the appropriate number of figures are recorded for each measurement.

Step 6: With the collected data, you will now need to perform calculations and follow-up questions and turn them in to CANVAS for **5 points**. Typically, there will be part of a lab period, or even an entire lab period, dedicated to helping with the calculations. The required lab calculations and follow-up questions will be available as a pdf at the beginning of each experiment under the calculation assignment for that lab. Due dates are on the canvas assignments.

IMPORTANT NOTE: Some labs may have questions and calculations throughout or at the end of the lab manual. While these questions may be similar, the real calculations for each lab are instead given on a pdf attached to the “calculations and questions” assignment for that lab.

Step 7: The last task is to write a **conclusion**. This section is the most important and often the most difficult because it requires deep consideration of the experiment as a whole. The conclusion should contain at least these three sections.

The first is a summary of the experiment, including the main goal and the methods used to collect/analyze data. This part should not be more than a paragraph and will be very similar to some of the content in the intro.

For the next section, **present the final values**. Many of the experiments require collecting a large amount of raw data, but including all of these values is not the point of this section. Only include the values or conclusions that directly relate to the experimental goal. Additionally, **compare** one trial to the next and/or compare the average value to literature values.

Finally, provide a source of error that may have resulted in differences between trials or between experimental averages and accepted values. This description should go beyond simple factors like human error and should connect an aspect of the experimental design or procedural step to any differences between the experimental and expected values. That is, explain how an error could have affected your result by following this error through the calculation process from data collection to final result.

The conclusion will be submitted through CANVAS and is worth **5 points**.

NOTE: Some of the point values for the green crystals lab assignments are larger because that lab is so much longer in terms of both the time in lab as well as the amount of data analysis.

Instructions for Half Labs (Vapor Pressure and Calcium Hydroxide)

For these two labs, you will do steps 1-4 from the Full Lab instructions section. After performing the experiment, you will complete a worksheet, but no extended calculation sheet or conclusion is required.

Molecular Polarity Worksheet. The material in Chapter 10 will require us to know if a molecule is polar. The molecular polarity worksheet is designed to help review this topic in preparation for chapter 10 and is worth **15 points**. In the second week of class, we will review molecular polarity during lab to accompany this worksheet.

Pipette Practice Worksheet. For the green crystal experiment, we will use a new and very delicate instrument called a micropipette to dispense extremely small volumes of liquid. To make sure we can properly and safely use this instrument before using in the analysis of our green crystals, there is a day of lab devoted solely to practicing with micropipettes and an associated worksheet worth **6 points**. Instructions on how to use the pipettes and how to do the worksheet will be given in the lab during week 4.

Formal Laboratory Report. For the kinetics experiment, you will do a formal, typed report worth **75 points** that will contain all parts of the lab together in one document, rather than individual parts turned in separately, as in the other labs.

In scientific research, conveying what you have discovered in a clear, concise manner is essential to making your new ideas accessible to others and allowing your contributions to help the world.

It may feel like something completely new if you have not done a scientific report, and that is okay. We will not be doing everything that a manuscript would require but rather looking to gain familiarity with presenting an experimental study. I will talk about the specifics during the introduction for this lab, and I will provide an instruction sheet to help with the structure of this report.

Lab Final. The lab final will test your understanding of the theories utilized in lab this quarter as well as the calculations implemented to yield results from the raw data. This exam will be during your lab time during the last week of class and is worth **100 points**. You will be allowed to use any notes you have taken throughout the entire quarter during this test, so it is beneficial to organize your work and pay attention during the lab introductions. No early or late exams will be allowed. No working with chemicals is required.

Grade Assignment. This rubric is subject to change throughout the quarter.

Grade	Percentage
A+	>97
A	97-93
A-	93-90
B+	90-87
B	87-83
B-	83-80
C+	80-76
C	76-70
D	70-60
F	<60

Lecture Schedule

Lecture topics are in black, quizzes are in orange, exams are in red, and holidays are in green. The dates for lecture topics may change but the exam dates will not.

Week #	Tuesday	Thursday
1	Chapter 9	Chapter 9
2	Chapter 9	Quiz 1 Chapter 9
3	Chapter 10	Chapter 10
4	Chapter 10	EXAM 1
5	Chapter 12	Chapter 12
6	Chapter 12	Chapter 13
7	Chapter 13	EXAM 2
8	Chapter 13	Chapter 13
9	Quiz 2 Chapter 14	Chapter 14
10	Chapter 14	EXAM 3
11	Chapter 16	Chapter 16

LECTURE FINAL EXAM: THURSDAY, March 28, 4:00 PM – 6:00 PM

Lab schedule

Week	MONDAY	TUESDAY	WEDNESDAY	THURSDAY
1	CHECK-IN	CHECK-IN	MOLAR VOLUME (1)	MOLAR VOLUME (1)
2	MARTIN LUTHER KING'S DAY	NO LAB	MOLAR VOLUME (2) STRUCTURE REVIEW	MOLAR VOLUME (2) STRUCTURE REVIEW
3	HEAT OF VAPORIZATION	HEAT OF VAPORIZATION	GREEN SALT (1)	GREEN SALT (1)
4	GREEN SALT (2)	GREEN SALT (2)	GREEN SALT (3)	GREEN SALT (3)
5	GREEN SALT (4)	GREEN SALT (4)	GREEN SALT (5)	GREEN SALT (5)
6	IODINE CLOCK REACTION (1)	IODINE CLOCK REACTION (1)	IODINE CLOCK REACTION (2)	IODINE CLOCK REACTION (2)
7	PRESIDENT'S DAY	STUDY DAY	IODINE CLOCK REACTION (3)	IODINE CLOCK REACTION (3)
8	IODINE CLOCK REACTION (4)	IODINE CLOCK REACTION (4)	Kc BY SPECTRO 20	Kc BY SPECTRO 20
9	Ka OF A WEAK ACID (1)	Ka OF A WEAK ACID (1)	Ka OF A WEAK ACID (2)	Ka OF A WEAK ACID (2)
10	CALCIUM HYDROXIDE (1)	CALCIUM HYDROXIDE (1)	CALCIUM HYDROXIDE (2)	CALCIUM HYDROXIDE (2)
11	SPILL OVER/STUDY DAY	SPILL OVER/STUDY DAY	LAB FINAL	LAB FINAL

Lab Safety/Preparedness

Maintaining safety when performing experiments is a primary concern. There are many hazards associated with chemistry labs, so it is essential to recognize these hazards and understand that with proper techniques, the risk drops significantly. There are a few very simple steps students should take to execute safe lab techniques.

First, always wear personal protective equipment (PPE) when performing lab experiments. Such items include, but are not limited to, safety goggles, long pants, sleeved shirts, and closed-toe shoes. **All of this safety equipment must remain on until you complete the experiment, including cleanup.** A detailed list containing safe lab procedures and general practices is given on the next and must be reviewed and signed before starting experiments.

Second, read the lab procedure BEFORE executing the lab procedure. Notes, facts, or some recognition of the hazards is required for the prelab to ensure the section on safety has been read. Reading the procedure ahead of time and knowing what tasks are at hand will also help the experiment go smoothly.

Finally, listen carefully to the directions provided by the instructor. Many techniques can be performed safely and easily with the proper technique but become a safety hazard when performed improperly

What follows is a list from the American Chemical Society Safety In Academic Laboratories Guidelines, 7th Ed., the following mandatory minimum safety requirements must be followed by all students and be rigorously enforced by all Chemistry faculty:

From the American Chemical Society Safety In Academic Laboratories Guidelines, 7th Ed., the following mandatory minimum safety requirements must be followed by all students and be rigorously enforced by all Chemistry faculty:

- 1)** Chemistry Department-approved safety goggles purchased from the De Anza College bookstore (NOT safety glasses) must be worn at all times once laboratory work begins, including when obtaining equipment from the stockroom or removing equipment from student drawers, and may not be removed until all laboratory work has ended and all glassware has been returned to student drawers.
- 2)** Shoes that completely enclose the foot are to be worn at all times; NO sandals, open-toed, or open-topped shoes, or slippers, even with socks on, are to be worn in the lab
- 3)** Shorts, cut-offs, skirts or pants exposing skin above the ankle, and sleeveless tops may not be worn in the lab: ankle-length clothing must be worn at all times
- 4)** Hair reaching the top of the shoulders must be tied back securely
- 5)** Loose clothing must be constrained
- 6)** Wearing "...jewelry such as rings, bracelets, and wristwatches in the laboratory..." should be discouraged to prevent "...chemical seepage in between the jewelry and skin...".
- 7)** Eating, drinking, or applying cosmetics in the laboratory is forbidden at ALL times, including during lab lecture
- 8)** Use of electronic devices requiring headphones in the laboratory is prohibited at ALL times, including during lab lecture
- 9)** Students are advised to inform their instructor about any pre-existing medical conditions, such as pregnancy, epilepsy, or diabetes, that they have that might affect their performance.
- 10)** Students are required to know the locations of the eyewash stations, emergency shower, and all exits
- 11)** Students may not be in the lab without an instructor being present
- 12)** Students not enrolled in the laboratory class may not be in the lab at any time after the first lab period of each quarter.
- 13)** Except for soapy or clear rinse water from washing glassware, NO CHEMICALS MAY BE Poured INTO THE SINKS; all remaining chemicals from an experiment must be poured into the waste bottle provided.
- 14)** Students are required to follow the De Anza College Code of Conduct at all times while in lab: "horseplay", yelling, offensive language, or any behavior that could startle or frighten another student is not allowed during lab;
- 15)** Strongly recommended: Wear Nitrile gloves while performing lab work; wear a chemically resistant lab coat or lab apron; wear shoes made of leather or polymeric leather substitute.

By signing below, I, _____,
First Name Family Name

acknowledge that I fully understand and agree to abide by the laboratory safety rules listed above. Further, I acknowledge that my failure to abide by these rules will result in my being dropped from this chemistry class immediately.

Signature

Date

Student Learning Outcome(s):

- Evaluate the principles of molecular kinetics.
- Apply principles of chemical equilibrium to chemical reactions.
- Apply the second and third laws of thermodynamics to chemical reactions.

Office Hours:

M,W	04:00 PM	05:30 PM	Zoom	
TH	03:00 PM	04:00 PM	In-Person	SC 1226