COURSE SYLLABUS

CHEM 1B - GENERAL CHEMISTRY (5.0 Units) **- SPRING 2026**

Reg ID: 44843-01, Section 53

Reg ID: 44845-02, Section 54

Note*: This syllabus is a contract which governs the policies and expectations for both you as the student and me as the instructor during this course. Whether or not you choose to read this document, you are bound by its contents for the duration of the quarter. It is in your best interest to review this entire document to understand your responsibilities in connection with this course.

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Contact Information

Instructor: Minh Hoang Huynh

Instructor email: huynhminh2@fhda.edu

Instructor Phone: (408)-893-1267, texting only. (E-mails and texts are usually answered within 24 hrs.)

Office Hours: In-person : T, Th (5:30 PM – 6:00 PM).

Zoom: T,Th (10:00AM – 11:00AM)

Class Meeting Times and Rooms:

Lecture: Tuesday and Thursday - 6:00PM - 7:15PM, Forum Building 1 (FOR1), De Anza Campus

Lab: Tuesday and Thursday - 7:30PM - 10:20PM, Science Center (SC2204), De Anza Campus

SPRING Term: Apr 06, 2026-Jun 26, 2026.

Course description

Purpose • This course is the second quarter of a three-quarter, one-year general chemistry sequence (Chem 1). The full sequence articulates to most one-year general chemistry sequences for chemistry non-majors at two- and four-year institutions.

Lecture content • The core of this course consists of three topics: thermodynamics, kinetics, and equilibrium. Thermodynamics describes changes in energy during a chemical reaction and can be used to predict the likelihood that a reaction will occur. Kinetics describes how reactions occur, the rate of chemical reactions, and the factors that affect reaction rate. Equilibrium describes chemical reactions as reversible, dynamic systems in which the distribution of products versus reactants depends on the change of energy during reaction. This course will also cover two other topics: the behavior of gases, and the effects of intermolecular forces on solids and liquids.

Lab content • A series of quantitative lab experiments reinforce the topics presented in lecture. Experiments include the calculation of the molar volume of a gas, the spectroscopic

determination of an equilibrium constant, the determination of a rate law through a kinetics experiment, and the synthesis and characterization of a transition metal complex.

Class structure

Sections • This course consists of two sections (see Table 1). Once you enroll in a particular section, you must attend only that section for the duration of the quarter. This course is completely independent of any other sections offered this quarter.

Class periods • This course is divided into a lecture and a lab, but only one grade is assigned for the course. The lecture and lab cannot be taken separately under any circumstances, since doing so would violate articulation agreements with other institutions. Even if you only need to complete the lecture to satisfy your transfer requirements or have previously taken the lab at De Anza, you are still required to complete the lab this quarter.

Table 1. Course Schedule

Table		Course Schedule	
Section	Room	Section 53	Section 54
Lecture	FOR1	T, Th : 6:00PM – 7:15PM	
Lab	SC2204	T, Th : 7:30PM – 10:20PM	

Grading Policy

Grades • The total number of points possible in this course is 1000 (see Table 2). No artificial curve is used in grading, meaning the final letter grade is based solely on the number of points earned. Final grades will be assigned based on a plus/minus grading scale (Table 3). A grade is 'C' or better is required to pass this course.

Lab points* • The total number of points possible in lab is 250. However, this point total can and will be reduced due to the improper handling of chemicals or waste, or the failure to maintain a safe and clean laboratory environment. See Section 7A for more information on this policy

Table 2: Point Distribution

Lecture				Lab (25%)			
Task	Pts	#	Total	Task	Pts	#	Total
				Short Report	10	5	50
Exam	140	4	560	Lab Report	20	2	40

Final	200	1	200	Lab Exam	75	2	150
Lecture Points			760	Lab Points			240*

Table 3: Grade Scale

Grade	%	Grade	%
A+	95-100	C+	73-76.99
A	90-94.99	C	70-72.99
A-	87-89.99	D+	66-69.99
B+	84-86.99	D	63-65.99
B	80-83.99	D-	60-62.99
B-	77-79.99	F	0-59.99

Registration

Deadlines • Registration deadlines (Table 4) are strictly enforced by De Anza in accordance with state regulations. Exceptions to deadlines are only made in extreme emergencies and usually require approval by the Dean or the Vice President of Instruction.

Enrollment • Due to safety concerns and space limitations, enrollment in each section of Chem 1A is strictly limited to 30 students – no exceptions whatsoever. You may not attend this class unless you are enrolled or auditing (see Section 3c). If you are on the wait list, you may attend lecture up until the add deadline to attempt to add into the course, but you cannot participate in lab experiments.

Wait lists • Open spaces in each section will be filled following the order of the official wait list; any remaining spaces will be filled on a first-come, first-serve basis.

Drops and withdrawals • If you do not attend the first day of class, I am required by contract to drop you from the course, unless you inform me in writing in advance. Additionally, if you are absent without excuse before the drop deadline, you may be automatically dropped from the course so that students from the wait list may add the course instead. After the drop deadline, you are entirely responsible for initiating any drops or withdrawals from the course. If circumstances beyond your control prevent you from completing this course, you may qualify for an incomplete or an excused withdrawal. For more information about incompletes and withdrawals, please see https://www.deanza.edu/admissions/withdrawals.html

Attendance

Attendance at all labs is mandatory. Although attendance at lectures is not mandatory, you are strongly encouraged to be present at all lectures. Notes from each lecture and lab will be posted to the class Canvas site (see Section 1j). All lectures, labs, and exams will be held in-person on the De Anza campus. This course cannot be taken in online format

Assessment schedule

Planning • In creating the assessment schedule for this course (Table 5), it is not feasible to anticipate and avoid the assessments of other courses, since each course runs at its own pace. Part of being an adept student is having the ability to balance the demands of different courses simultaneously. You have been given this schedule at the beginning of the quarter, so you have ample forewarning to properly manage your study time. Assessments will not be given on alternate days due to the workload in other classes.

Schedule changes • Although every attempt will be made to adhere to the established assessment schedule, unforeseen circumstances could require a change in which day an assessment is given. Difficulties resulting from such unexpected changes will be handled on an individual basis.

Final exam • The final exam for this course will held in-person on **Tuesday, June 23, 2026 at 6:00 PM in room FOR1** (This is subject to change and in case of change will be discussed with you 3 weeks in advance). The final will last exactly two hours. This time has been assigned by the college and cannot be changed except in dire emergencies (see Section 3b for details). The final exam will not be given at an alternate time due to the final exam schedule of other courses.

Assignments

Types of assessments • Exams are broad assessments that focus on material present since the beginning of the quarter or since the previous exam. Although exams are not explicitly cumulative, many concepts in chemistry are employed throughout the course and build on each other. The final exam is a comprehensive, cumulative assessment that covers all material presented in lecture. The final exam does not include lab-related material, but it will include lecture-related material presented in lab. The lab exam is focused solely on material presented in lab, including material presented during lab lecture as well as any calculations or interpretations associated with your lab reports. No lab final is given during finals week, only a lecture final. Format • Types of questions on assessments may include: true/false, definitions,

short-answer, calculations, and formats specific to this course, such as naming substances or drawing molecular structures. No multiple choice questions will be given. Time and place • All exams will be held in-person at the beginning of lecture in room S32. All lab exams will be held inperson at the beginning of lab in room SC2204. Homework • Working problems at the end of each chapter is one absolutely assured way to increase your understanding of the course material. Recommended problems can be found in Table 6 (next page). As this is a college-level course, homework will not be collected or graded; it is entirely up to you to discipline yourself to do as many problems as may be necessary for you. All assignments are offered and graded exclusively in English.

Course Materials

1. Textbook: Chemistry: A Molecular Approach, 6th edition by Nivaldo J. Tro (Pearson: 2022, ISBN 978-0-137493-61-6)
2. Alternate texts • There are other excellent texts available which may be useful if you are seeking additional problems or an alternate presentation of the course material. If you wish to use an alternate text, please consult with me first so that I can advise you whether the text you intend to use is appropriate for the level of this course. Due to the high cost of textbooks, if you have already purchased a previous edition of the official text, you are welcome to use the old edition, with the understanding that the problem numbers and section numbers (or even topics) in older editions may not match those found in this syllabus.
3. Suggested problems • In addition to the in-chapter problems in each section, the problems listed below are suggested for further skill development. These problems are not necessarily an indicator of the types of questions that will be found on assessments, but they do address the same material. Although homework can improve your understanding immensely, you are not required to submit homework, so you are not required to use any homework system the may be associated with the text.
4. Labtext: The official lab text for this course has been prepared by the chemistry department is available for free. All experimental procedures will be posted to the course Canvas site.
5. Before beginning a new experiment, you are required to complete a pre-lab for that experiment (see Section 5c for more information). Some experiments are comprised of multiple parts; in those cases, a pre-lab only needs to be prepared for the parts indicated for that day in the schedule below, unless otherwise announced.
6. A laboratory notebook for recording your experimental procedures and results (see Section 5b)

7. Chemical safety goggles (see Section 4b for more information about appropriate safety goggles)

Online resources

This course requires the use of the Canvas platform for the submission of lab reports. You can access Canvas either through your MyPortal account or directly at https://deanza.instructure.com/. You are automatically added to the Canvas site for this course when you register for the course. If you are on the waitlist, you are unable to access the Canvas site; you will gain access if you are added to the course. Audio recordings of all lectures and lab lectures are posted to the Canvas site in mp3 format, and all written notes from lecture and lab lectures are posted in pdf format.

Disability accommodations

Accommodations for a range of disabilities are available through Disability Support Programs & Services (DSPS). To receive an academic accommodation on assessments – such as additional time, a reduced-distraction environment, or the use of alternative media or assistive technology – you must first be evaluated by Disability Support Services (DSS) and obtain a Test Accommodation Verification (TAV) form. Absolutely no accommodations can be provided on assessments without a valid TAV form.

Code of conduct

All De Anza students and staff are expected to abide by the District Code of Conduct, which is based on the following four principles: 1) mutual respect between students, faculty, and staff; 2) pursuit of studies with honesty and integrity; 3) respect for College and personal property; and, 4) compliance with all rules and regulations. Violations of the Code may be reported for disciplinary action and, in extreme cases, may prompt your removal from the class pending further disciplinary action.

Lecture Schedule

Week	Day	Lecture Schedule
1	4/7	Gas Kinetic Molecular Theory
	4/9	Ideal gas law
2	4/14	Phase changes

	4/16	Intermolecular forces
3	4/21	**Exam 1**
	4/23	Phase diagrams Water
4	4/28	Kinetics Collision theory
	4/30	Rate laws Reaction mechanisms
5	5/5	**Exam 2**
	5/7	Equilibrium Equilibrium constants
6	5/12	Le Châtelier's Principle
	5/14	Solving equilibrium problems
7	5/19	Acids and bases The pH scale
	5/21	**Exam 3**
8	5/26	Strong versus weak acids Acid-base reactions
	5/28	Spontaneity Entropy
9	6/2	Free energy
	6/4	**Exam 4**
10	6/9	Reaction progress diagrams
	6/11	Final Exam Review
11	6/16	Backup Day
	6/18	Backup Day
12	6/23	**Final Exam Day**
	6/25	Last Day

Lab Schedule

Week	Day	Lab Schedule	Assessment
1	4/7	Introduction and check-in	
	4/9	Lab B1 – Molar volume of an ideal gas	
2	4/14	Lab B2 – Heat of vaporization	
	4/16	Lab B2 – Heat of vaporization	
3	4/21	Lab B7 – Synthesis and characterization of a green salt	Short B1
	4/23	Lab B7 – Synthesis and characterization of a green salt	
4	4/28	Lab B7 – Synthesis and characterization of a green salt	

	4/30	Lab B7 – Synthesis and characterization of a green salt	Short B2
5	5/5	Lab B7 – Synthesis and characterization of a green salt	
	5/7	Lab B3 – Iodine clock experiment	
6	5/12	Lab B3 – Iodine clock experiment	Long B7
	5/14	Lab B3 – Iodine clock experiment	
7	5/19	Lab B3 – Iodine clock experiment	
	5/21	Lab B4 – Equilibrium constants	
8	5/26	Lab B4 – Equilibrium constants	Long B3
	5/28	Lab B5 – Ka of a weak acid	
9	6/2	Lab B5 – Ka of a weak acid	Short B4
	6/4	Lab B8 – Effects of temperature on equilibrium	
10	6/9	Lab B8 – Effects of temperature on equilibrium	Short B5
	6/11	Lab Exam Review	
11	6/16	Lab Exam and check-out	Short B8
	6/18	No Lab	
12	6/23	No Lab	
	6/25	Last Day – No Lab	

More Policies

Absences

If you are absent from class, please contact me by e-mail and provide a brief explanation for your absence so that I have a written record, even if the reason for your absence is as simple as sleeping through your alarm. Without written notice, no opportunity will be given to make up any missed work (see Section 3b below for more details). Depending on the reason for your absence, you may be required to provide some form of verification of your absence such as a doctor's note or jury summons. If you are absent for any reason before the add deadline (see Table 4) passes without justification or notification, you will be automatically dropped from the class so that someone from the wait list may take your place. By contract, I am required to drop any student that does not attend on the first day of class.

Make-up policies

Lecture • No assignments will be given during lecture, so there is nothing to make up if you miss lecture on a day no erxam is given. Audio recordings of the lecture and written notes can be found online at the class Canvas site (see Section 1j).

Lab lecture • If you are absent from lab on a day when a pre-lab is due, you must show me that pre-lab on the very next day that you are in class (see Section 5c for information on pre-labs).

Audio recordings and written notes of the lab lectures can be found online at the class Canvas site (see Section 1j).

Lab • Our lab program operates under tight constraints on both resources and space; as such, the chemicals for any one experiment are only available for a limited number of lab periods. If the chemicals happen to be available the next lab you attend, you must be prepared to complete the missed work in parallel with whatever other experiment you are supposed to conduct that day. If you are unable to complete an experiment due to one or more legitimate absences, the grade for the missing lab will be based on an alternate assignment related to the actual lab. You may not attend another lab section to make up a missed lab, unless I am the instructor of that section, there is space available in that lab, and your participation in that section is approved in advance.

Lab exam • Missed lab exams can be made up only in the event of an excused absence and must be taken by the very next time that you attend class, regardless of whether it is for lecture or for lab; otherwise, you will receive a score of zero on that assessment. If you wish to make up the assessment before your next regular class session, you may make arrangements to come during office hours or at some other mutually agreed-upon time. Due to problems with academic integrity, make-up lab exams will differ from the original versions given in class, although they will be of comparable difficulty.

Exams • Due to problems with academic integrity, missed exams normally cannot be made up. If you miss an exam due to truly exceptional circumstances – such as a debilitating accident or the death of a close relative – then the opportunity to make up the exam may be given, although the exam will differ from the original version. Otherwise, the grade for the missing exam will be substituted by your grade on the final exam (adjusted proportionally for the difference in the number of points possible).

Final • The final exam time and date is assigned by De Anza and cannot be changed. Be sure to schedule any travel around your final exam time. If a true, verifiable emergency arises and you are unable to take the final exam within the scheduled time, please contact me immediately by e-mail explaining you situation. If circumstances warrant it, alternate arrangements will be made for you to complete your final. If for whatever reason you are unable to take your final exam before the end of the quarter, a grade of incomplete may be given so that you may finish the work at a later time. If the incomplete is not resolved within a mutually established time frame, a zero will be given for the final and your grade will be assigned based on your remaining work.

Grading Options

Pass/No pass • If you are taking this course to receive course credit but do not need to receive a letter grade, this course can be taken on a pass/no-pass basis. A grade of 'C' or higher is considered passing, while a grade of 'D+' or lower is considered nonpassing. You must designate this course as pass/non-pass before the official registration deadline (see Table 4). Once the deadline has passed, you cannot later convert a pass/non-pass grade into a letter grade or vice versa.

Auditing • If you have taken this course before at De Anza or another community college, you may take this course again on an audit basis for review. Auditing students may attend lecture and lab lecture but may not participate in lab experiments and will not receive credit for the course. Information about auditing can be found at https://www.deanza.edu/policies/auditing.html

Plus/Minus grades • According to State education code, the maximum grade point possible for a course is 4.0, meaning that a grade of 'A+' is equivalent to a grade of 'A' for the purposes of calculating GPA. Additionally, since a grade of 'C' is considered the minimum passing grade for a course within the California Community College system, there is no such grade as 'C–' at De Anza.

Electronic Resouces

Cell phones, tablets, computers, and similar devices may be used in class as long as they are in silent mode. No electronic devices may be used on assessments except for approved, dedicated calculators (see Section 1k for academic accommodations).

Academic Integrity

Cheating and plagiarism are two of the most serious academic violations of the Code of Conduct (see Section 1l). No matter how difficult your life situation might currently be, and no matter how much pressure you might be under to succeed or to help someone else, I do not consider cheating or plagiarism to be excusable in any form or under any circumstance. I fully believe such a lack of ethics in this early phase of your academic career is indicative of how you will behave in your future occupation, and since many of your are seeking careers in professions that involve the public, I find such behavior not merely unethical but dangerous. Any student(s) caught cheating or plagiarizing on any assignment will automatically receive zero credit for that assignment. Further, all instances of cheating or plagiarism will be reported to the deans of Physical Sciences, Math, and Engineering (PSME) and of Student Development for further disciplinary action, which in extreme cases may result in expulsion from De Anza.

Expectations

Self-reliance • It is only through your own effort and dedication that you will ever truly master the material in this course. I can teach you in every way imaginable, but I can do nothing to make you learn; I can only act as your guide. You have to be the one that dedicates yourself to your own future.

Time • Although the quantity of time needed to master the material will vary widely from person to person, a standard academic guideline is to expect that – between reading, review your notes, and working problems – you will need to set aside at least two hours for studying for each hour of lecture or lab lecture.

Reading • Chemistry is its own language. Even common English words have a completely different meaning in a chemical context; for example, a hood is normally something worn over the head, but in lab it is a safety system for removing hazardous fumes. Therefore, the only way I can conduct a lively class discussion is if you read all assigned passages before you come to class. I do not expect you will understand everything that you read – otherwise there would be no need for this course – but you will be far more able to participate in and benefit from class discussions by reading ahead of time. If English is not your primary language, reading in advance is even more crucial, since it provides you the opportunity to familiarize yourself with new vocabulary or terminology first so you are far more able to understand a lecture.

Participation • I am not a video to be viewed passively; I am a living, breathing, feeling creature that expects to interact with you in class. When I ask a question or request participation from the class, I get irritated when I receive no form of response. I do not expect that you, individually, will always have the right answers, but I do expect that you, the class, will be engaged.

Problems • Working problems is often an extremely effective means of mastering a concept. I only have limited time in lecture, so I cannot cover every single detail presented in the text. You must take it upon yourself to work as many problems as you deem necessary in order to succeed. When you do work problems, resist the urge to look at the answer key first. You will learn far more by first running into the proverbial brick wall then learning from your mistakes than simply glancing at the answer.

Proficiency • Assessments for this course are designed under the assumption you have reached a reasonable level of proficiency in each concept or skill. If it takes too long for you to solve problems because of a lack of practice, you will unable to complete the assessments. Likewise, you are expected to be able to address the heart of a problem with concise yet complete answers. If you answer in several paragraphs what requires just a few sentences to express, you

will never finish; yet, if you answer in just a few words what requires a few sentences to clearly express, you are unlikely to receive full credit.

Submitting Assignment Online

All assignments turned in online will be submitted through Canvas (see Section 1j); assignments sent by e-mail will not be accepted. If you have a physical document that needs to be converted into electronic format and do not have access to a document scanner, many apps such as Adobe Scan and Genius Scan are available for using your phone as a scanner. All online assignments must be submitted in PDF format. Several tools are available for converting a wide range of electronic formats into PDF format

Artificial Intelligence (AI) Policies

My personal opinions on artificial intelligence are complex and continue to evolve. At this time, the use of generative artificial intelligence in any form – including but not limited to ChatGPT or OpenAI – is expressly prohibited on any assignment in this course. The use of these forms of artificial intelligence will be considered a form of plagiarism (see Section 3e). You may use narrow artificial intelligence for spelling, grammar, or formatting suggestions only. No artificial intelligence of any form was used to create this syllabus, and it will not be used in the production of any assessments or notes for this course.

Diversity

Each of us is born into different cultures, raised speaking different languages, driven to follow different beliefs, compelled to preserve different traditions, trained to follow different conceptions of the Divine. But we all breathe the same air, we all drink the same water, we all are warmed by the same sun, we all marvel at the same moon, we are all made of the same atoms. Beneath our skin lies less than a 1% variation in our genetic composition, so to discriminate on the basis of race, color, national or ethnic origin, age, gender, religion, marital status, sexual orientation, physical ability, economic disposition, social status, political affiliation, or physical appearance is to focus on these insignificant differences between us and ignore the fact that we are all human.

Student Learning Outcomes (SLOs)

1. Identify and explain trends in the periodic table.
2. Construct balanced reaction equations and illustrate principles of stoichiometry.
3. Apply the first law of thermodynamics to chemical reactions.

Copyrights

Lab Safety

The chemistry department has adopted the following rules from the American Chemical Society Safety in Academic Laboratories Guidelines, 7th edition, as mandatory for all students in all chemistry lab classes. The following rules apply at all times in all areas of the lab building, regardless of the activity that is occurring:

1. Shoes that completely enclose the foot must be worn at all times; no sandals, open-toed or open-topped shoes, or slippers, even with socks on, may be worn in lab. Shoes made out of leather or polymeric leather substitute are strongly recommended.
2. Shorts, cut-offs, skirts, or pants exposing skin above the ankle, and sleeveless tops or tops that expose the abdomen, may not be worn in lab; ankle-length clothing must be worn at all times.
3. Eating, drinking, or applying cosmetics in the laboratory room is forbidden at all times, including during lab lecture. Food and drink containers must be stored outside of the lab.
4. The use of headphones and earbuds in lab is prohibited at all times, including during lab lecture, as you must be able to hear any emergency announcements made. The following rules concern the laboratory space itself:
5. Students are required to know the locations of eyewash stations, emergency showers, and all exits.
6. Students may not be in any lab spaces unless an instructor is present.

7. Students must follow the Code of Conduct at all times while in the lab. Any behavior that could startle, frighten, or injure anyone in the lab is not allowed.

8. Glass and needles must only be disposed of in the appropriate containers, never in the regular trash.
9. Except for soapy or clear rinse water from cleaning glassware, no chemicals may be poured into any sink; any remaining chemicals from an experiment must be poured into the appropriately labeled waste bottles.

The following rules concern personal protective equipment (PPE) and must be followed anytime glassware or chemicals are out and in use in the lab. If you have completed your experiment but other students still have chemicals or glassware out, these rules still apply:

Department-approved safety goggles (not safety glasses) must be worn at all times, including when obtaining items from the stockroom or moving equipment to or from your locker, and may not be removed until all lab work has been completed and all chemicals and glassware have been stored.

10. Nitrile gloves must be worn when handling chemicals and glassware and removed prior to handing any personal items, such as electronic devices, or opening any doors.
11. Hair reaching the top of the shoulders or lower must be tied back securely.
12. Loose clothing must be constrained; form-fitting clothing should be avoided as chemicals can be held against the skin.
13. Chemical- and flame-retardant lab coats are strongly recommended.
14. Wearing jewelry (rings, bracelets, watches, etc.) is discouraged as chemicals can seep in between jewelry and skin.

Personal protective equipment (PPE)

Eye hazards • Chemicals can certainly cause eye injury, but glassware can be just as great of a hazard in lab. For example, if a beaker with cold water shatters, the water will not cause any injury, but the flying pieces of broken glassware certainly have the potential to cause harm. In fact, it is often innocent bystanders that are injured since they may not be immediately aware of what is occurring next to them. As such, you must wear your goggle the entire time chemicals or glassware are out or in use – even if you are finished with lab but you are still in the lab room. Refusal to wear your safety goggles during your entire time in lab will result in your expulsion from the course.

Type of goggles • Your safety goggles must be specifically designed for chemical lab work and carry an ANSI Z87.1 shatter rating; goggles designed for yard or industrial work are not adequate. Your safety goggles must make a seal all the way around your eyes to prevent objects or chemicals from striking from the sides, and they should also have indirect venting. If you wear prescription glasses, you must still wear safety goggles over your regular glasses. If

you wear prescription glasses and will be taking several lab classes, you may want to consider purchasing a pair of prescription safety goggles.

Gloves • To reduces your chemical exposure in lab, you are required to wear disposable nitrile gloves when handling chemicals or glassware. Gloves are provided free of charge by the chemistry department.

Lab coats • To protect both yourself and your clothes, you are strongly encouraged to purchase a lab coat. Your lab coat should be chemical-resistant and flame-retardant.

Medical considerations

Although your health and medical history is entirely confidential and you are in no way obligated to divulge any such private information to me, if you are aware that you have an allergy to a specific compound being used in an experiment, for your own safety you should inform me prior to the experiment so I can determine whether alternate arrangements should be made. Similarly, if you have a preexisting medical condition that may impact your ability to operate safely in a lab environment, I request (but cannot require) that you let me know so that I can assist you in the event of an emergency.

Pregnancy

If you are pregnant or experiencing a related condition, you are strongly advised to contact the campus Title IX coordinator, Laureen Balducci (balduccilaureen@fhda.edu) to arrange any necessary accommodations.

Emergencies

Spills • Do not attempt to clean spills yourself. Notify me so that I can quarantine the area and begin mitigation procedures.

Chemical exposure • Have someone alert me and immediately rinse the affected skin or clothing with large amounts of water.

Eye exposure • If chemicals splash in your eye, immediately flush your eyes at an eyewash station and have someone alert me.

Injury • If you are cut or burned during a lab, please notify me immediately so I can send you for appropriate medical treatment.

Evacuation • In the event the room must be evacuated, use only doors marked ‘exit’ and proceed to the track and field area.

Fire • Do not attempt to put out any fires yourself. Notify me immediately and prepare to evacuate the room if necessary.

Earthquake • Step away from equipment, duck under a desk until the shaking stops, then evacuate to the track and field

Chemical hygiene

Chemical safety

Most chemicals inherently have some form of health risk associated with them. A chemical might be a irritant, a lachrymator (causes you tear up or choke), a carcinogen (causes cancer), a mutagen (causes genetic mutations), a teratogen (cause fetal deformations), a pyrophor (spontaneously ignites upon contact with air), or a neurotoxin (attacks the nervous system). Although in relative terms many of the chemicals used in this course are not overtly hazardous, others can be quite harmful and can cause injury and/or truly hazardous reactions if handled improperly, so you should always take appropriate precautions to protect yourself (see Sections 4a, 4b, and 4c). Additionally, you should always wash your hands immediately after you exit the lab area, especially before eating, using the restroom, or applying cosmetics.

Chemical storage

All stored samples must be clearly labeled with the English name(s), not formula(s), of the primary hazard(s) in the container, the date the sample was created, and your name. All liquids must be stored in containers sealed with the appropriate lid or stopper to prevent evaporation. Solids may be stored in open containers, for example when drying a precipitate, but such containers must be stored in secondary containment to prevent spillage.

Chemical segregation

Chemical containers must be placed into a larger storage bin that prevents the materials from spreading if one of the containers somehow breaks. This additional precaution is known as secondary containment, and it is meant to prevent unintended chemical reactions in the event of a catastrophe like an earthquake. To further reduce the chances of an adverse chemical reaction, only compatible substances or mixtures may be stored together in the same secondary containment. For example, acids may only be stored with other acids and cannot be stored along with bases, and oxidizers and reducers must similarly be separated. Chemical waste must also be appropriately stored and segregated (see Section 4g for further details).

Chemical disposal

General directions • No chemicals or waste may ever be poured down the sink unless specifically directed an instructor. All waste must be disposed of in appropriately labeled waste containers. If you accidentally pour a chemical down the sink, notify me immediately so I can quarantine the area and initiate the appropriate protocol for mitigating the spill. Types of waste • There are three types of waste containers available in the lab: acidic aqueous, basic aqueous, and organic. Each kind of waste must be stored in its own secondary containment. Rinses • When cleaning glassware, the first rinse with either water or another solvent should be treated as hazardous waste and disposed of in the appropriate waste container. Subsequent rinses with water can be disposed down the drain if there is no obvious sign of chemical contamination remaining. Labels • All waste bottles are labeled with the type of waste they contain and the name of the instructor who prepared the bottle. Always make sure you check that you are disposing of waste only in a bottle that I labeled that corresponds to the correct waste type. Waste is also labeled as to whether it contains solids or liquids. Solids may be disposed of in containers labeled for liquids, but liquids may not be disposed of in containers labeled for solids. This is so that the waste can be properly packed for transportation when it is removed from the lab. Fill level • Waste bottles should never be filled completely to the top; instead, a small amount of "head space" must be kept above the level of the liquid, so that the contents of the container have room to shift in the event the container is suddenly dropped or shaken violently. Please let me know right away whenever a bottle reaches its fill level so that I can general another waste container.'

Chemical safety rules

- Always read labels twice; for example, it is easy to misread "sodium nitrite" for "sodium nitrate" when you're in a hurry.
- Always refer to the Safety Data Sheet (SDS) for any substance or mixture for which you are uncertain of the hazards.
- Always return any reagent bottles to their appropriate secondary containment after you are finished with them.
- Never leave any substance or mixture uncapped after use, as it may potentially react with the surrounding environment.
- Never return unused reagents to their original containers as you must assume they are contaminated once removed.
- Never take a personal stock of reagents to use at your own bench since the excess cannot be returned so it will be wasted.

- Never re-use the same pipette to transfer a substance or mixture once that pipette makes contact with another object.
- Never consume any products made in any lab, as the regents and techniques you will use are not pharmaceutical grade.
- Never remove any chemicals from the laboratory as you are not licensed to transport hazardous materials.
- Never use chemical refrigerators to store food or any other personal items.
- All ethanol in the lab has been intentionally poisoned so as to render it unfit for consumption, human or otherwise.

Lab notebooks

In research, a laboratory notebook is a crucial legal document that never leaves the lab. Many research projects, such as the synthesis of naturally-occurring molecules, cannot be accomplished by a single researcher within a single year. The discoveries made must therefore be passed down in a way that the results can be reliably duplicated; that vehicle is the laboratory notebook. Research can be a competitive endeavor, with academic, industrial, or governmental groups often vying for limited economic resources. In a patent dispute, a well-annotated notebook can make the difference in winning or losing the case (and maybe your job). In fact, it is common practice for researchers to sign each page of a notebook to affirm its legitimacy

Lab notebook format

Type of notebook • Your lab notebook should be bound (not loose-leaf) and not have removable or perforated pages. A simple composition notebook will suffice. Your lab notebook does not need to have carbon copies, and you may reuse a lab notebook from a previous course.

General • Never erase, write in pencil, or use white-out in a lab notebook! In legal cases, any alterations may be considered forms of forgery. Always write in pen. Mistakes should be corrected by drawing a single thin line through the original data, leaving them still legible; this way you can still recover your original result if it turns out it was correct! Finally, any data you collect should be immediately recorded directly into your lab notebook, not stored on a post-it note (or the back of your hand) for copying later.

Table of contents • Any organized lab notebook begins with a table of contents. Each entry might include the page number(s), experiment title, and the date the experiment was performed. You might not see the usefulness of a table of contents in a class such as this

wherein only a few experiments are performed, but if you are in a research lab where literally hundreds of reactions might be run, a table of contents is absolutely necessary.

Experiments • At the very minimum, each experiment must include a title, a completed pre-lab (see Section 5c), and any data or observations you directly acquired during the lab. If you are a science major and/or you are otherwise interested in maintaining a more complete laboratory notebook, additional suggestions for experiment formatting can be found in Section 5e.

Pre-labs

Before each new experiment, you are required to prepare a pre-lab. On the first day of a new experiment, I will verify whether you have completed the pre-lab satisfactorily. If your pre-lab is not complete, you will not be allowed to perform the experiment and will therefore receive a zero for that lab. There are four reasons why I insist you complete a pre-lab ahead of time:

Safety • If you are unfamiliar with the procedure for an experiment before coming to class, you are not aware of the hazards you might encounter. You are therefore a danger to both yourself and the other students in the class.

Courtesy • If you are not prepared for an experiment and you constantly ask people around you for help, you are distraction to those who took the time to properly prepare for their lab, and distractions can lead to mistakes.

Efficiency • If you do not prepare for an experiment before coming to lab, you will waste a lot of time trying to figure out how to conduct the experiment, which means you may not be able to complete the experiment in time.

Learning • Whether or not chemistry is your favorite subject, you have signed up for this course, so you might as well take the time to benefit from it. If you prepare before an experiment, you are far more likely gain something from it.

Pre-lab format

Pre-labs should be prepared directly in your lab notebook. Unless otherwise directed, you do not need answer any pre-lab or post-lab questions in the laboratory manual. Your pre-lab should include, at a minimum, the following three items:

Chemical hazards • List any important safety information about the chemicals you are using that is given in your experimental procedure. If the procedure does not give any specific chemical safety information for a particular substance, you can find more information online by searching for that substance's Safety Data Sheet (SDS).

Chemical disposal • List each substance or mixture generated during the experiment and the appropriate waste container – acidic aqueous, basic aqueous, or organic – it should be disposed in. If you are unsure how a substance or mixture should be properly disposed, leave a space so that you can fill in that information during lab lecture.

Procedure • You must rewrite the full procedure in your own words with enough detail that you can perform the lab successfully without referring to lab textbook. Do not simply copy the procedure verbatim. You do not have to include any portions of the experiment that are related only to theory, just include the procedure itself.

Advanced formatting

Reaction scheme • If you running a more complex experiment, I highly recommend you include a reaction scheme. This might take the form of an abstract, a flowchart, a series of diagrams, a set of mechanisms, or a set of synthesis steps. You might include key reagents, solvents, environmental conditions, or hazards.

Reagents • Preparing a table of reagents can be useful in planning for an experiment since you can therefore determine how much of each substance or mixture you will need. For each reagent you are going to use, you might include its name and/ or formula, molar mass, the mass or volume to be used (with units!), moles (if appropriate), or molarity/molality (for solutions).

Procedure • For your pre-lab procedure, I recommend using a two-column format – the first column wide, the second column narrow. In the first column, you can list your step-by-step procedure, while in the second column you can record any data you obtain, such as the mass of a sample. Since your results will be located right next to the corresponding step in the procedure, you will be able to more easily find your results when you write your lab reports.

Lab reports

Chemical research is usually published in peer-reviewed journal articles. This means the research has been submitted to an academic journal that vetted the research through a panel of reviewers before it was published. These articles usually follow a standard format: (i) relevant background information and the justification for the research; (ii) the goal of the research; (iii) a vividly detailed experimental procedure; (iv) all relevant data, calculations, and interpretations; and (v) all conclusions drawn from the data, along with hints at future research possibilities. The format for lab reports in this class will follow the same spirit as these journal

articles, although the implementation will be dramatically simplified since no new research is being performed here.

Lab report structure

Title • The title should be short and to the point. Please number your reports in chronological order, meaning the first report should be titled “Lab 1: ...”, the second report “Lab 2: ...”, and so forth.

Objective • Clearly state each key quantitative or qualitative result you of the experiment – for example: “The purpose of this experiment is to determine the concentration of acetic acid in household vinegar.” The fact that you learned from the experiment, while important, should not be mentioned at all in the objective, since the report is about the results, not about you.

Procedure • Do not include the procedure in your report. You have already prepared the procedure for your pre-lab, so there is no reason to include the procedure again in your report. No bibliographic reference to the report is needed either.

Data and calculations • Information about formatting data and calculations can be found in Sections Formatting Data and Formatting Calculations.

Conclusion • Your conclusion should exactly parallel your objective – meaning you should state exactly those qualitative or quantitative results that were the focus of the experiment. This means that the conclusion could potentially be just a one-sentence statement, such as: “The concentration of acetic acid in household vinegar was determined to be 0.829 M.”

Discussion • When appropriate, you should include a brief discussion of how your observations led to your conclusion, and, when possible, you should compare your results to accepted results. For example, if a lab involves the synthesis of a compound, your discussion could contain your interpretation of any relevant spectra that demonstrate the formation of that compound. Alternately, if a lab involves determining the molarity of a known solution, your discussion should include a calculation of the percent error. Finally, you should describe any specific, significant sources of error, but only if those sources can be clearly identified.

Lab report formatting

Digital format • All lab reports must be typed, and all tables, graphs, and diagrams must be electronically generated. Handwritten work, such as worksheets from the lab text, must be converted into digital format (see Section 3g). If you do not have regular access to a computer, the Library West Computer Lab is available for any De Anza student to use. There is no charge to use the computers, and since you will be submitting your reports electronically (see Section 6d), you will not need to print anything. Third person • Research articles in the field of

chemistry are almost universally written entirely in third person, meaning that you should never use first person ('I', 'me', 'my', 'mine', 'we', 'us', 'our', 'ours') or second person ('you', 'your', 'yours'), and you should also never use the impersonal third person 'one' as a subject. For example, instead of writing "I measured the temperature every ten seconds", you should use a passive construction: "The temperature was measured every ten seconds". It is exactly because this writing style is passive that it is used, since the focus of most research is on the science, not the scientists.

Submitting lab reports

All lab reports must be submitted through the Canvas system (see Section 3g) in PDF format. If you generate spectra or other printed data during an experiment, your data should be converted into digital format and included as part of your report.

Data versus calculations

Data are the specific numerical or qualitative observations directly obtained during an experiment. Any form of manipulation of these data, no matter how small, is a form of calculation. For example, imagine you want to measure the mass of a liquid. You could first measure the mass of a beaker, followed by the combined mass of the beaker and the liquid. These two measurements would be considered data, since they were directly observed. The mass of the liquid itself could only be obtained by subtracting one measurement from the other, so the mass of the liquid would be considered a calculation. You should use your own best judgment in determining how to logically present your data and calculations in your report.

Formatting data

Labels and units • Every piece of data should have an intelligible label such as "mass of crucible" or "sample number", and any numerical piece of data must always be written with the appropriate unit(s) of measure, if applicable.

Variables • It is often helpful to define a variable name for a piece of data, meaning an abbreviation that can be used to represent that datum in mathematical equations. For example, the temperatures of three different samples might be labeled T1, T2, and T3. Make sure that your variable names make intuitive sense and/or that they are clearly explained.

Typography • Chemical formulas must be written with proper subscripts and superscripts. For example, the formula for magnesium phosphate must be written "Mg3(PO4)2", not "Mg3(PO4)2", and the copper (II) ion should be written Cu+2, not Cu+2. Also, remember that spell checkers are not logic checkers; for example, you likely mean "trial 1" instead of "trail 1", and "molarity" instead of "morality". Learn how to properly create a degree symbol (°), and

remember water is ‘H2O’ (with the letter ‘O’), not “H20” (with the number zero)! Science is very detail oriented, and so is the way scientific results are reported.

Tables • Any large or related sets of data must be presented in the form of a table when it makes sense to do so.

Formatting calculations

Labels, units, and variables • All calculations must include appropriate labels and units. Clearly define any variable names used in your calculations; for example, do not use the variable ‘x’ unless you define what ‘x’ is.

Prototype formula • For each unique calculation you perform, you must write out the mathematical formula corresponding to that particular calculation once. For example, calculating the number of moles of water used in a reaction can be expressed in words (moles of water = mass of water ÷ molar mass of water) or by using logical abbreviations (nwater = mwater ÷ MMwater). This way, if you arrive at an incorrect result in your calculations, I can at least verify whether you used the correct formula and simply made a computational mistake, or whether instead you made a conceptual mistake and used the wrong formula.

Substituted formula • Following a prototype formula, each unique calculation must include one example of the equation substituted with your own data. For example, the number of moles of water obtained from 10.00 g of water can be written as nwater = 10.00 g H2O ÷ 18.01 g/mol H2O = 0.5552 mol H2O. This way I can tell if you substituted the wrong piece of data in the wrong spot in the equation. If you performed multiple trials, you should state which trial the substituted data came from.

Tables • If you perform the same calculation multiple times – for example, determining the densities of six different solutions – do not include full calculations for each trial. There is no benefit in seeing the same calculation over and over – it simply takes up space in your report and interrupts the flow of your discussion. For each unique calculation, only one prototype formula and one substituted formula is necessary. The results of multiple identical calculations should then be summarized in a table.

Average values • If you perform multiple trials of an experiment, you should calculate the overall result from each trial separately and then average the overall results from all of the trials together. Although frequently the same mathematical result would be obtained by averaging the data from multiple trials together and then performing only one set of calculations, this is not always the case, and it is also conceptually incorrect, since the results from one trial cannot influence another.

Acceptable collaboration

While it is entirely acceptable for you to work together with others from the class to analyze the data from an experiment, you must prepare and submit your own individual lab reports. No portion of a report, including any text, tables, graph, or formatting styles, may be shared from one person to another. Any such sharing will be considered a form of plagiarism (see Section 3e).

Safety enforcement

Responsibility • Maintaining a clean and safe laboratory environment is the direct responsibility of every student in the class. Unfortunately, during lab I far too frequently counter tops with chemicals spilled on them, balances left with unidentified solids covering them, reagents bottles left open with their contents evaporating into the open, pipettes left dripping outside of their bottles, bits of contaminated pH paper scattered around the lab, and so on. Even though De Anza is not a research facility, there are still very real chemical hazards present in our labs, and any amount of unnecessary chemical exposure is unacceptable. Failure to immediately clean a chemical spill because you cannot be bothered to spend the minute or two necessary to do so demonstrates that you have no concern for the environment around you, nor your own personal safety, nor the safety of others. It also violates the legal requirement to proper store, segregate, and dispose of chemicals. It is not the job of faculty of staff to maintain a clean laboratory; it is the user of the space – you – who is wholly responsible.

Enforcement • Violations of lab safety and cleanliness are grouped into three categories: chemical safety (Section 7b), chemical disposal (Section 7c), and lab cleanliness (Section 7d). At the beginning of each lab period, both you and I will assess the condition of the laboratory space, including the balance room and instrument room. Any violations that we find will be documented so they can be communicated to the instructor(s) of the previous lab(s) and then remedied before commencing with our lab. If at any point during the lab I discover a violation has occurred, a penalty of one (1) point will be deducted for each violation from the total possible number of lab points, up to a total of ten (10) points per day. If the violations occur in a common area, this penalty will apply to everyone in the section, as this is unfortunately the only recourse I have to ensure the common areas are kept clean.

Chemical safety

Chemical spills • All chemical spills must be cleaned up immediately, particularly in common areas such as the balance room.

Secured reagents • All reagents bottles must be kept properly sealed when not in active use.

Secondary containment • All chemicals must be kept in appropriate secondary containment when not in active use.

Segregated containment • All chemicals must be segregated according to these classes: acid, base, organic, or oxidizer.

Sealed samples • All products must be stored in sealed containers, except for non-reactive solid products being dried.

Labeling • Stored products must be labeled with the full English name of the primary hazard(s), the date, and your name

Chemical disposal

Sinks • Absolutely no chemicals may be poured down the sink (see Section 4g for further details).

Disposal area • The secondary containment area where waste bottles are stored must be kept clean from any spills.

Chemical compatibility • All waste must be disposed of according to these classes: acid, base, or organic.

Designated container • Unless otherwise directed, you may only use waste containers labeled with my initials (DHG).

Fill line • All waste containers must be maintained with some empty space at the top. Never completely fill a waste container.

Lab cleanliness

Common areas • Items from common areas, such as filter papers, pipettes, and pH paper, must be properly disposed.

Fume hoods • Any spills in fume hoods, including sand or residues left over from evaporation, must be cleaned up during lab.

Sinks • No solid debris should be left in any of the sinks. Please help to ensure the strainers in the drains are also kept clean.

Glass and needles • Broken glass and needles must only be disposed of in appropriate containers, never in regular trash.

Equipment • Any equipment used during a lab, such as hotplates or stands, must be properly stored before leaving lab.

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:

T,TH	10:00 AM - 11:00 AM	Zoom,Canvas