

CHEMISTRY 12B SYLLABUS

GENERAL INFORMATION Winter 2026

CHEMISTRY12B (CHEMD012B.03) CRN34851 Modality: In-person on-campus course

Instructor: Chad Miller E-mail: millerchad@fhda.edu

Lecture	Tuesday & Thursday	12:30PM – 1:45PM	Room SC1102
Lab Section	Tuesday & Thursday	8:30AM – 11:20AM	Room SC2210
Office hours	Tuesday & Thursday	2:00PM – 3:00PM	S1206 conference room

Course Description: This course explores the physical properties and chemical behavior of important classes of organic compounds, focusing on alkynes, polyenes, aromatic compounds; alcohols, thiols, and ethers; and aldehydes and ketones and their derivatives. Retrosynthesis, spectroscopic structure determination, and the reaction mechanism will be examined in the course. Laboratory experiments will involve the synthesis of simple compounds and the characterization of those compounds using chromatography and infrared (IR), ultraviolet-visible (UV-Vis), and nuclear magnetic resonance (NMR) spectroscopy. This course is for chemistry majors or those in closely-allied fields such as biochemistry and chemical engineering. A grade of C or better in Chemistry12A is a prerequisite.

Required Materials:

- ✓ **Textbook:** McMurry, Organic Chemistry, 10th ed, OpenStax <https://openstax.org/details/books/organic-chemistry> (PDF download)
- ✓ **Lab Text:** *Experimental Organic Chemistry: A Miniscale and Microscale Approach, 6e*, by John C. Gilbert and Stephen F. Martin (Brooks/Cole: 2015; ISBN 978-1-305-08046-1)
- ✓ **OSHA-approved Safety Goggles** (Indirect Vent, Z87) & chemical resistant lab gloves (nitrile for latex-free)
- ✓ **Carbonless copy lab notebook:** 100 page carbonless copy spiral bound notebook. ISBN: 1429224541
- ✓ **Standard combination lock for lab drawer** (or small bike lock) to lock an assigned laboratory drawer.

Recommended:

- ✓ **Textbook:** *Organic Chemistry, 3e*, by David Klein, ISBN:978-1-119-31615-2 Klein, David. *Organic Chemistry, 3rd edition*, John Wiley & Sons: New Jersey, 2017. (Wiley publisher site for eBook options: (Copy link and paste in browser) <https://www.wiley.com/en-us/Organic+Chemistry%2C+EPUB+with+Enhanced+Student+Solutions+Manual+and+Study+Guide%2C+3rd+Edition-p-9781119351603> and De Anza bookstore: <https://www.deanza.edu/bookstore/> or other outlets)

Important Dates: Please note the following dates

[Waitlisted students are not added to the class after the first week of class.]

- ☑ **January 6: Attend the 1/06 & 1/08 lecture and lab meetings to maintain your registration.**
- ☑ **March 26: Final Exam date. 11:30AM – 1:30PM SC1102**

Classroom Courtesy: We want to achieve the highest level of learning experience in lecture and in lab and to accomplish that please refrain from conducting any unrelated conversations, cell phone activity (no calls, texts, IMs, browsing or camera use) and any other behaviors that would be disruptive to yourself, others and to the instructor. Students who engage in disruptive conduct will be required to leave the classroom. Computers in the lectures and lab can only be used for activities pertaining to the course material. Recording class lectures or related activities always requires the direct approval of the instructor.

Attendance & Academic Integrity: Students are expected to attend all lectures and labs. The course Grading Policy details the specifics for lack of attendance. All incidents of dishonest, unethical behavior including any cheating, copying the work of others and claiming it is your originality (also known as plagiarism), altering any graded exams, quizzes, lab reports, other classroom materials will be reported to the College Administration. It is your responsibility to recognize academic dishonesty: <http://www.deanza.edu/studenthandbook/academic-integrity.html>

Any manner of dishonesty observed, detected or suspected will result in consequences that impact academic performance. Maintaining a bond of trust and confidence between student and instructor is vitally important.

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NOTE: Copyright protection of instructor course materials: All materials developed and/or authored by this course instructor are protected by US copyright law and may not be distributed or sold to any third parties including individuals who are not course-registered students, other individuals, companies, Web sites and content aggregators or any other party that has no valid or lawful right to possess such materials. Any such legal distribution of materials requires in advance of distribution the written consent, including signature and date, of this instructor. Any violation of this policy will result in appropriate legal action.

NOTE to transferring students: This instructor is not responsible for student academic performance or the grade outcome that might be committed by a student to a transfer school for the successful completion (a grade C or higher) of this course to meet transfer school admission requirements. It is the responsibility of the student to manage any and all course grades or attendance commitments made on their behalf to transfer schools.

Contact me: Students may arrange to meet me during my office hours for additional support on the course content. Students may also contact me outside of class and lab hours by email at millerchad@fhda.edu. I attempt to respond to email messages that I receive on class weekdays (Mondays through Thursdays) in a timely manner which might be that same day or the following day. Email messages that are sent on Fridays or weekends will likely be replied to early the following week.

Instructional and Student Resources: De Anza College provides a variety of resources to facilitate learning experiences including those listed below. Please visit <http://www.deanza.edu/student-services/> to learn more.

- **De Anza College Winter quarter guide:** <https://www.deanza.edu/quarter-guide/>
- **Student Success Center:** <http://www.deanza.edu/student-success/> Tutoring is available for on-site and online tutoring on a range of subject matter including chemistry. Resources are in Bldg S43.
- **Counseling and Advising Center:** <http://www.deanza.edu/counseling/> Provides support in the form of counseling and assistance on academic matters and personal challenges.
- **Disability Support Programs & Services:** <http://www.deanza.edu/dsps/> Offers support services including accommodations and educational classroom assistance designed to help students with disabilities. Resources are in the [RSS Room141](#) and can be reached at 408.864.8753.

GRADING POLICY CHEM12B Chad Miller Winter 2026

Assessment	Points Each	Total Points	Percent of Total
Lab assignments; technique, safety	100/50	150	15%
Lab Exam (1)	150	150	15%
Lecture quiz (1)	50	50	5%
Midterms (2)	200	400	40%
Final exam	250	250	25%
Total		1,000	100%

Grade	% of Total Points	Grade	% of Total Points
A+	98% - 100%	B-	77% - 79%
A	91% - 97%	C+	74% - 76%
A-	88% - 90%	C	65% - 73%
B+	85% - 87%	D	55% - 64%
B	80% - 84%	F	<55%
% of total points determines the letter grade			

Lab Assessments:

1. Competency in the lab will be assessed by lab assignments, pre-labs, lab safety and cleanliness, lab technique and a lab exam. The lab exam accounts for 50% of the total lab point score.
2. Laboratory experience is an essential component of this course and each lab must first be prepared for in advance by submitting the 'pre-lab' assignment, then the lab must be attended and properly and safely conducted.
3. The format, structure and information content which are expected in pre-lab assignments and lab assignments will be fully described during the first lab meeting.
4. Attendance at the first lab meeting is a requirement to remain registered in this course.
5. All submitted written work in the lab must be of the student's original authorship regardless of the individual performance of the lab or with a lab partner.
6. A pre-lab assignment is due at the start of the lab meeting. Pre-labs will be checked, but not scored. A student may not participate in the lab if the pre-lab assignment was not completed on its due date.
7. There will be no (zero) make-up labs. Students must attend lab lectures to participate in each lab.
8. If three (3) or more labs are missed (not attended) a grade of 'F' will result in the course. It is thus highly recommended to attend and complete all lab sessions and not risk a non-passing grade.
9. Competent and efficient lab technique, adherence to safety compliance, self-sufficiency, teamwork and lab cleanliness will be monitored and will contribute 50 points to the total lab point score.
10. Adherence to proper lab safety, instructor directives and lab cleanliness/housekeeping are critical. Improper attention to these requirements and practices can result in a drop from the course.

One (1) Lecture Quiz and two (2) Lecture Midterm Exams:

1. The lecture quiz must be taken on the date defined in the schedule and there will be no make-up quiz.
2. Exam scores will not be dropped and the midterm exams need to be taken on their scheduled dates.
3. If a midterm exam is missed due to an emergency medical situation or family emergency and proper documentation is provided to the instructor, the score on the two remaining midterms will be averaged and then applied to the missed exam score. There is no accommodation if two midterm exams are missed; the score on each will be a '0'.
4. There are no extra credit projects or activities that are part of this course and there is no point contribution of any such activity in lieu of or in addition to any course assessments.

Final Exam:

1. The Final Exam will assess the student's ability to understand and apply the correct skills to problem solving based on the cumulative knowledge gained from learning the course content.
2. The Final exam cannot be rescheduled, dropped from the total course grade or substituted.

It is each student's responsibility to attend all lectures and labs in order to gain the knowledge of the chemistry content and the problem-solving skills that are covered and assessed in this course.

Lecture assessments, including the lecture quiz, the two midterms and the final exam, are administered in-person in class. Students are expected to work individually unless otherwise directed by the instructor.

Students who glance at other students' solutions on exams (or quiz) or chat during an exam (or quiz) will receive a score of zero (0) on that exam (or quiz). Cheating on assessments results in serious consequences.

The use of AI-powered resources may from time to time support an understanding of the chemistry content, however, their use is prohibited during assessments including the lecture quiz, midterms, lab and final exams.

SCHEDULE CHEM12B Winter 2026 Chad Miller (Lecture & Lab content subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 1/06	Syllabus; Course logistics; CH9: Alkynes: reactivity, acidity, acetylides, reduction	Lab check-in; Safety overview NMR and IR spectroscopy review	
1	Thur 1/08	CH9: Alkynes: HX addition, hydration hydroboration, oxymercuration	Alkynes: IR spectra, Lindlar's catalyst & dissolving metal reductions, halogenation	
2	Tues 1/13	CH9: Alkynes reactions and synthesis	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	
2	Thur 1/15	CH17: Alcohols: Properties of alcohols, nomenclature, relative acidity, methods of preparation, reductions of carbonyls	Lecture Quiz Lab1 continued	Lecture Quiz
3	Tues 1/20	CH17: Protection & deprotection OTs; preparation of alkyl halides HX, PBr ₃ , POCl ₃ , SOCl ₂	Alcohol oxidation methods & mechanisms, H ₂ CrO ₄ , KMnO ₄ , PCC, Swern; Grignard reagents for the preparation of alcohols	
3	Thur 1/22	Synthesis strategies 1: alkynes, alcohols, ethers, epoxides	NMR and IR instrumentation Lab 1 assignment	
4	Tues 1/27	Midterm1 review session	Synthesis strategies 1	
4	Thur 1/29	CH19: Aldehydes and ketones: properties, synthesis, reactivity	MIDTERM 1	MIDTERM 1
5	Tues 2/03	CH19: Aldehydes and ketones: mechanisms, reduction, acetal formation	Lab2: Reduction of 9-fluorenone Theory: 621-624,651-652 Proc: 653	
5	Thur 2/05	CH19: Reactions with amines to form imines & enamines; cyanohydrin, reductions; Grignard & cuprate reactions	Lab2 continued; Lab 2 assignment	
6	Tues 2/10	CH19: Wittig reaction; preparation; mechanism; use in synthesis; Baeyer-Villiger oxidation	Lab3: Grignard reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	
6	Thur 2/12	CH19: Aldehydes and ketones; organocuprates vs Grignard additions Miller solution guide-Synthesis strategies	Lab3 continued Lab 3 assignment	
7	Tues 2/17	CH14: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control;	Synthesis methods & strategies aldehydes & ketones	
7	Thur 2/19	CH14: Pericyclic reactions; cycloadditions, Diels Alder; regioselectivity; endo vs exo stereochemistry	Lab4: Wittig reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	
8	Tues 2/24	CH14: cycloadditions, Diels Alder examples in synthesis; Electrocyclic reactions	Lab4: Wittig reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731 Lab 4 assignment	
8	Thur 2/26	Midterm 2 review session	Electrocyclic reactions; orbital symmetry; conrotatory & disrotatory mechanisms; Woodward-Hoffmann rules	
9	Tues 3/03	CH15: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	MIDTERM 2	MIDTERM 2
9	Thur 3/05	CH16: Aromatic substitution reactions; activating & deactivating groups, directional effects; Friedel-Craft reactions	Lab5: Kinetic vs Thermodynamic Introduction to mass spectrometry	
10	Tues 3/10	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab6: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
10	Thur 3/12	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab6: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
11	Tues 3/17	CH16: EAS, Nucleophilic aromatic substitution mechanisms & reactions	Lab6 assignment Check out	
11	Thur 3/19	Final exam review session	Lab exam	LAB EXAM
12	Tues 3/26	Final exam 11:30AM – 1:30PM		FINAL EXAM

Chemistry Department lab safety guidelines

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) or available in the lab as community worn goggles 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.

The Chemistry Department has implemented a safety presentation and a required safety quiz for students. Compliance with the safety protocols and procedures is essential and students who are not compliant will not be able to participate in any laboratory activities. The safety quiz, which will be available on Canvas, must be successfully completed prior to the first chemistry lab. The completion of the safety quiz is recorded and submitted to the Department.

Students must read, sign, date and turn in the Chemistry Department safety contract, which is available on Canvas, to the instructor before participating in any of the lab procedures.

Rules for Safe and Efficient Chemistry Laboratory Operations

1. *Prepare for each experiment by reading all of the directions before lab starts.*
2. *Locate the Safety Equipment.* Know the locations of the eye wash, safety shower, fire extinguishers, fire blankets, first aid kit, fume hoods, telephone and all exits that are to be used in an emergency. Your laboratory instructor will describe the use of the safety equipment.
3. *Protect your eyes.* Wear approved eye protection at all times when handling glassware or chemicals. provide maximum safety. Prescription glasses, if you need them, must be worn under approved eye protection. Contact lenses should not be worn in the laboratory because fumes may accumulate under the lenses and injure your eyes and the lenses make it difficult to flush chemicals from your eyes.
4. *Tie long hair back.* This precaution will keep your hair out of burner flames and harmful chemicals.
5. *Do not wear clothing with loose, flowing sleeves.* This precaution will keep your sleeves out of burner flames and harmful chemicals.
6. *Wear shoes that cover all of your feet.* Broken glass on the laboratory floor and spilled chemical reagents are all too common. Shoes that cover your feet completely will protect them from broken glass and chemical splashes. The best types of shoes are closed-toe made out of leather.
7. *Wear clothes that cover your torso and your legs to the knees.* Clothing will give your body needed protection. Good clothing can be protected with a lab apron or coat.
8. *Do not eat or drink in the laboratory. Do not taste any chemical reagent.*
9. *Do not smell chemical reagents directly.* When you are instructed to smell a chemical, do so by gently wafting the vapors toward your face. Do not inhale deeply.
10. *Do not pipette solutions by mouth.* Use a rubber suction bulb to fill the pipette.
11. *Do not work with flammable liquids near a flame.*
12. *Do not engage in games or horseplay in the laboratory.* Never run in the laboratory.
13. *Do not attempt unauthorized experiments in the laboratory.*
14. *Do not work in the laboratory in the absence of your instructor or his or her authorized representative.*
15. *Use a fume hood when required.*
16. *Handle glass tubing and thermometers carefully.* When inserting glass tubing or thermometers through a rubber stopper, always hold the glass close to the stopper and use a lubricant such as glycerin to help the glass slide through the stopper. Do not continue to try to force glass through a stubborn stopper, get a new stopper and/or get help. When inserting a pipette into a pipette bulb, hold the pipette near the bulb and GENTLY insert the pipette.
17. *When diluting, never pour water into concentrated reagents.* Always pour the reagent into the water.
18. *If you spill a chemical reagent on yourself, immediately flood the exposed area with water and then summon the laboratory instructor. Inform the instructor immediately about any other accidents or spills.*
19. *Be aware of your neighbors. Are they obeying the safety rules? A neighbor's accident may injure you.*
20. *Avoid touching your face and rubbing your eyes while in the laboratory.* If you must do so, first wash your hands. *Wash your hands before leaving the laboratory.*
21. *Never heat a closed container.* Pressure build up can cause the container to explode.
22. *Assume any chemical is hazardous if you are unsure.*
23. *Do not violate any other safety rule issued by your laboratory instructor.*

Housekeeping Rules:

1. *Clean up broken glass immediately with a broom and dustpan. Do not use your hands.* Dispose of broken glass in the special container that is provided, never in a regular trash can.
2. *Chemical spills must be cleaned up immediately.* Immediately notify your instructor who will advise you how to clean it up and/or assist you. Dispose of the collected contaminated chemical properly as instructed.
3. *Do not pour any chemical down into the sink or in the trash without authorization.* Clearly labeled disposal bottles will be provided when needed.
4. *Take containers to the stock of chemical reagents.* Do not bring stock chemicals to your laboratory bench.
5. *Read the label on a reagent bottle carefully.* Is it the correct chemical? Is it the correct concentration?
6. *Do not insert your own pipette, medicine dropper or spatula into a stock bottle.*
7. *Use special care with stoppers or tops of stock bottles.* Do not allow them to pick up contamination. Your instructor will provide additional instructions for handling the stoppers or tops found in your laboratory.
8. *Always replace the stopper or top of a stock bottle when you are finished taking some of the reagent.* Make sure that you put the stopper or top back onto the correct bottle.
9. *When pouring liquid from bottles, hold the bottle with the label against the palm of your hand so that the liquid is poured from the side opposite the label.* If any liquid runs down the outside of the label, immediately wipe off the liquid.
10. *Do not take any more of a reagent than is required.* Many of the chemicals used in the laboratory, including deionized water, are costly.
11. *Never return any unused reagent to a stock bottle.* If you take too much of a chemical, dispose of it as directed by your instructor or offer it to a classmate who needs it.
12. *Set up your glassware and apparatus away from the edge of your laboratory bench.*
13. *Thoroughly clean the area around your laboratory bench and the top of your laboratory bench before leaving lab.*
14. *Keep shared areas of the laboratory clean.* This includes areas such as the balance room and where the stock bottles are stored. It is especially important to keep the balances clean and free of chemical spills.
15. *Keep your laboratory equipment clean.* Good results depend on clean equipment.
16. *If a piece of equipment containing mercury is broken, inform your laboratory instructor immediately.* Keep the area blocked off to avoid scattering the mercury.
17. *Follow any other housekeeping rules given by your laboratory instructor.*

Student Learning Outcomes

- Construct logical multi-step syntheses for organic molecules.
- Use molecular orbital theory and resonance theory to explain reactions of benzene and other molecules with conjugated π systems.
- Increase breadth of knowledge of organic reactions to include functional groups containing oxygen, benzene and more complex pi-bonding systems.
- Construct molecular structures of increasingly complex molecules from IR, ^1H NMR, and ^{13}C NMR spectral data.

Our Chemistry 12B course content demands attendance and consistently focused attention, the implementation of a conducive study environment, effective study practices and an individual resolve and motivation to achieve success.

This is the second quarter of a one-year sequence of organic chemistry with the expectation that students already developed an awareness of how to manage academic challenges when taking light or heavy STEM loads. A good-natured attitude combined with genuine motivation and time-management skills certainly help keep students on track.

Attend all lectures and labs. This is one of the most important recommendations I can provide. There is a significant amount learning that takes place during each class lecture and in each lab and the optimal way to learn and keep current with the stream of content is to attend and participate in all learning activities in class and individual and team activities in the labs.

The grading policy reflects the need to maintain attendance and the requirement to plan ahead to be present for all quizzes, exams, labs and the final exam.

Key Success Factors:

- ✓ Read textbook chapters and review lecture presentation materials in advance of class.
- ✓ Participate in class discussions and problem-solving sessions.
- ✓ Ask questions in class to gain clarification and a correct understanding and attend office hours.
- ✓ Prepare for all labs by reading the lab text references in advance of the labs.
- ✓ Identify and establish and maintain a compatible study environment free of distraction.
- ✓ If helpful, and it is my recommendation, study with classmates to supplement private study.
- ✓ Learn the material as it is presented and do not accumulate unread chapters or content.
- ✓ Do not attempt to study too much material at any one point.
- ✓ Do not cram before exams – pace your study and problem solving at the class tempo.
- ✓ Try to maintain a healthy lifestyle to facilitate learning and balance school, work and life.

Student Learning Outcome(s):

- Construct logical multi-step syntheses for organic molecules.
- Use Molecular Orbital theory and Resonance to explain reactions of benzene and other molecules with conjugated π systems.
- Increase breadth of knowledge of organic reactions to include functional groups containing oxygen, benzene and more complex π systems.
- Construct molecular structures of increasingly complex molecules from IR, ^1H NMR, and ^{13}C NMR data.

Office Hours:

T,TH	5:30 PM - 6:00 PM	ADM119
T,TH	5:30 PM - 6:00 PM	ADM119
T,TH	2:00 PM - 3:00 PM	S1206