CHEMISTRY 12B SYLLABUS

GENERAL INFORMATION Spring 2025

CHEMISTRY12B (CHEMD012B.53 and 54) CRN46108, 48743 Modality: In-person on-campus course

Instructor: Chad Miller E-mail: millerchad@fhda.edu Office: SC1222

Lecture	**Tuesday & Thursday**	**6:00PM – 7:15PM**	**Room ADM119**
Lab Section 53	**Tuesday & Thursday**	**2:30PM – 5:20PM**	**Room SC2210**
Lab Section 54	**Tuesday & Thursday**	**7:30PM – 10:20PM**	**Room SC2210**
Office hours	**Wednesday**	**11:00AM – 12:30PM**	**Room SC1222**

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.]

- ☑ ***April 8: Attend the 4/08 lecture and lab meetings to maintain your registration.***
- ☑ ***June 24*: Final Exam date. 6:15PM – 8:15PM ADM119**

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/studentservices/ to learn more.

- **De Anza College Winter quarter guide**: https://www.deanza.edu/quarter-guide/
- **Student Success Center:** http://www.deanza.edu/studentsuccess/ 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 Spring 2025

Assessment	Points Each	Total Points	Percent of Total
Lab reports; technique, safety	100/50	150	15%
Lab Exam (1)	100	100	10%
Lecture quiz (1)	50	50	5%
Midterms (3)	150	450	45%
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 reports, pre-labs, lab safety and cleanliness, lab technique and a lab exam. The lab exam accounts for 40% 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 followed by the timely completion and submission of the lab report.
3. The format, structure and information content which are expected in pre-lab assignments and lab reports will be fully described during the first lab meeting. Attendance at the first lab meeting is a requirement to remain registered in this course.
4. All submitted written work in the lab (i.e., pre-labs and lab reports) must be of the student's original authorship regardless of the individual performance of the lab or with a lab partner. On occasion, students may share experimental data however all lab reports must be individually written. Submitted work that is copied from another student will be scored as '0' (zero) points and such student will receive one warning regarding academic dishonesty. Any additional copied reports that are submitted will result in a report to Administration as a violation of academic integrity and code of honesty.
5. 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.
6. The lab report is due at the start of the following week's lab lecture (typically, 1 week after the lab) unless an alternative date is determined by the instructor. Late lab reports will not be graded unless approved in advance by the instructor. Lab reports contribute 40% (100/250) to the total lab points.
7. There will be no (zero) make-up labs. Students must attend each lab lecture in order 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 20% (50/250) 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 three (3) Lecture Midterm Exams:

1. The dates of the lecture quiz and lecture midterm exams are defined in the Schedule.
2. The lecture quiz must be taken of the date defined in the schedule and there will be no make-up quiz.
3. Exam scores will not be dropped and the midterm exams need to be taken on their scheduled dates.
4. 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'.
5. 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.

SCHEDULE CHEM12B Winter 2025 Chad Miller (Lecture & Lab content subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 4/08	CH9: Alkynes: acetylides; preparation, hydrogenation, reduction	Lab check-in. Review: Alkene reactions & synthesis	
1	Thur 4/10	CH9: Reactions; halogenation, HX, hydration; hydroboration; oxidation	NMR and IR spectroscopy and instrumentation	
2	Tues 4/15	CH9: Reactions and synthesis	Lab1: Oxidation of cyclododecanol **Theory:** 585-593 **Proc:** 593-595	
2	Thur 4/17	CH17: Alcohols: Properties of alcohols; nomenclature, synthesis; Grignard reactions, hydride reductions	Lab1: Oxidation of cyclododecanol **Theory:** 585-593 **Proc:** 593-595	
3	Tues 4/22	CH17: Protection & deprotection; OTs; halides using HX, PBr_3, $POCl_3$, $SOCl_2$; oxidations H_2CrO_4, $KMnO_4$, PCC, Swern	Lecture Quiz Lab1 continued. CH17: Protection & deprotection; OTs; HX, PBr_3, $POCl_3$, $SOCl_2$	Lecture Quiz
3	Thur 4/24	Synthesis strategies 1: alkynes, alcohols, ethers, epoxides	Lab1 continued. CH18: Ethers and thioethers; epoxides; reactivity and synthesis	
4	Tues 4/29	Midterm1 review session	Synthesis strategies 1 continued	
4	Thur 5/01	CH19: Aldehydes and ketones: properties, preparation; nucleophilic additions, reductions, acetal formation	Midterm 1	MIDTERM 1
5	Tues 5/06	CH19: Reactions with amines to form imines & enamines; cyanohydrin, reductions; Grignard reactions	Lab2: Reduction of 9-fluorenone **Theory:** 621-624,651-652 **Proc:** 653	
5	Thur 5/08	CH19: Wittig reaction; preparation; mechanism; use in synthesis; Baeyer-Villiger oxidation	Lab2 continued. Imines, enamines, Grignard reactions; Wittig reactions, mechanism, use in synthesis	
6	Tues 5/13	CH19: Aldehydes and ketones reactions and synthesis	Lab3: Grignard reaction (Part A) **Theory:**715-719,725-727 **Proc** 719-720, 728-731	
6	Thur 5/15	CH19: Aldehydes and ketones reactions; Synthesis strategies 2	Lab3 continued. Aldehydes, ketones reactions and synthesis	
7	Tues 5/20	CH14: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control; organocuprates vs Grignard additions	Midterm 2	MIDTERM 2
7	Thur 5/22	CH14: Pericyclic reactions; MO theory; Diels Alder; regioselectivity; transition states and endo vs exo stereochemistry	Lab4: Wittig reaction (Part A) **Theory:**715-719,725-727 **Proc** 719-720, 728-731	
8	Tues 5/27	CH14: Electrocyclic reactions; orbital symmetry; conrotatory & disrotatory mechanisms; Woodward-Hoffmann rules	Lab4: Wittig reaction (Part A) **Theory:**715-719,725-727 **Proc** 719-720, 728-731	
8	Thur 5/29	Ch14: Synthesis strategies 3; Diels-Alder and pericyclic reactions in synthesis	Ch14: Diels-Alder and pericyclic reactions in synthesis	
9	Tues 6/03	CH15: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	Midterm 3 review session	
9	Thur 6/05	CH16: Aromatic substitution; EAS; activation-deactivation; directional effects; oxidation & reduction	Midterm 3	MIDTERM 3
10	Tues 6/10	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab5: Diels Alder reaction Part A **Theory:** 421-425 **Proc:** 426	
10	Thur 6/12	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab5: Diels Alder reaction Part A **Theory:** 421-425 **Proc:** 426	
11	Tues 6/17	CH16: Friedel-Craft reactions; Nucleophilic aromatic substitution	Check out. Lab Exam	LAB EXAM
11	Thur 6/19	Final exam review session	Synthesis of substituted aromatic compounds	
12	Tues 6/24	Final exam 6:15PM – 8:15PM		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.

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, ^{1}H NMR, and ^{13}C NMR spectral data.

CHEM 12B SUCCESSFUL STUDY PRACTICES

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 13C NMR data.

Office Hours:

W	11:00 AM - 12:30 PM	SC1222
W	1:00 PM - 2:00 PM	SC1222