

GENERAL INFORMATION**CHEMISTRY12B (CHEMD012B.03) CRN34851 Winter 2024****Instructor: Chad Miller E-mail: millerchad@fhda.edu**

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

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.

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)
- ✓ Molecular model kit for organic chemistry – many options available
- ✓ Lab coat

Important Dates: Please note the following dates

- ☑ **Jan 9:** *Attend the Jan 9 lecture and lab meetings to maintain your registration in this course.*
- ☑ **Mar 1:** **Deadline to drop classes with a grade of 'W'**
- ☑ **Mar 28:** **Final Exam date. 11:30AM – 1:30PM**

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>

Covid-19 Policies: Please consult the De Anza College return-to-campus web page and any announcements on your student portal that detail relevant information pertaining to the campus regulations and policies pertaining to Covid-19. <https://www.deanza.edu/return-to-campus/students.html>

GENERAL INFORMATION

CHEMISTRY12B (CHEMD012B.03) CRN34851 Winter 202

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

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.

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.

SCHEDULE CHEM12B Winter 2024 Chad Miller (Lecture & Lab content subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 1/09	CH9: Alkynes: acetylides; preparation, hydrogenation, reduction	Lab check-in. Review: Alkene reactions & synthesis	
1	Thur 1/11	CH9: Reactions; halogenation, HX, hydration; hydroboration; oxidation	NMR and IR spectroscopy and instrumentation; basics of mass spectrometry	
2	Tues 1/16	CH9: Reactions and synthesis	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	
2	Thur 1/18	CH17: Alcohols: Properties of alcohols; nomenclature, synthesis; Grignard reactions, hydride reductions	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	
3	Tues 1/23	CH17: Protection & deprotection; OTs; halides using HX, PBr ₃ , POCl ₃ , SOCl ₂ ; oxidations H ₂ CrO ₄ , KMnO ₄ , PCC, Swern	Lecture Quiz Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	Lecture Quiz
3	Thur 1/25	Synthesis strategies 1: alkynes, alcohols, ethers, epoxides	Lab1. CH18: Ethers and thioethers); epoxides; reactivity and synthesis	
4	Tues 1/30	Midterm1 review session	Synthesis strategies 1 continued	
4	Thur 2/01	CH19: Aldehydes and ketones: properties, preparation; nucleophilic additions, reductions, acetal formation	Midterm 1	MIDTERM 1
5	Tues 2/06	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 2/08	CH19: Wittig reaction; preparation; mechanism; use in synthesis; Baeyer-Villiger oxidation	Lab2: Reduction of 9-fluorenone Theory: 621-624,651-652 Proc: 653	
6	Tues 2/13	CH19: Aldehydes & Ketones synthesis strategies 2	Lab3: Grignard reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	
6	Thur 2/15	CH19: Aldehydes and ketones reactions and synthesis strategies	Lab3: Grignard reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	
7	Tues 2/20	CH14: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control; organocuprates vs Grignard additions	Midterm 2	MIDTERM 2
7	Thur 2/22	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 2/27	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 2/29	Ch14: Synthesis strategies 3; Diels-Alder and pericyclic reactions in synthesis	Ch14: Diels-Alder and pericyclic reactions in synthesis	
9	Tues 3/05	CH15: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	Midterm 3 review session	
9	Thur 3/07	CH16: Aromatic substitution; EAS; activation-deactivation; directional effects; oxidation & reduction	Midterm 3	MIDTERM 3
10	Tues 3/12	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab5: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
10	Thur 3/14	CH16: Friedel-Craft reactions; Electrophilic aromatic substitution	Lab5: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
11	Tues 3/19	CH16: Friedel-Craft reactions; Nucleophilic aromatic substitution	Check out. Lab Exam	LAB EXAM
11	Thur 3/21	Final exam review session	Synthesis of substituted aromatic compounds	
12	Thur 3/28	Final exam 11:30AM – 1:30PM		FINAL EXAM

GRADING POLICY CHEM12B Chad Miller Winter 2024

Assessment	Points Each	Total Points	Percent of Total
Lab reports, safety, technique	variable	200	20%
Lab exam	100	100	10%
Lecture quiz	50	50	5%
Midterm 1, 2, 3	150	450	45%
Final exam	200	200	20%
Total Points		1,000	100%

Grade	% of Total Points	Grade	Percent 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. 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 a lab report/assignment.
2. The format and content of pre-lab assignments and lab reports/assignments will be described during the first lab meeting.
3. All submitted written work for the lab (i.e., pre-labs, lab reports/assignments) must be of the student's original authorship. Per instruction, students may share experimental data, however all lab reports & assignments 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 or assignments that are submitted will result in a report to Administration as a violation of academic integrity and code of honesty.
4. A pre-lab is due at the start of the lab meeting. The pre-lab will be marked as complete or incomplete; it is not scored. A student may not participate in the lab if a proper pre-lab was not submitted on its due date and time and marked as complete.
5. The lab report is typically due one week following the completion of the lab unless an alternative date is determined by the instructor. Late lab reports will not be graded. The instructor might substitute a lab assignment for a formal lab report. All such reports & possible assignments are individually weighted and account for a total of 150points.
6. There will be no (zero) make-up labs. Time and facilities will not permit rescheduling of labs for students in this course. Students need to attend each lab lecture in order to participate in each lab.
7. If a lab is missed and excused by the instructor, a lab partner data set will be provided. A second missed lab will be scored as "0" points unless excused by physician documentation. If three (3) or more labs are missed (not attended/no instructor approval) a score of '0' points will be given to the total lab score.
8. Competent lab technique, safety compliance, self-sufficiency, teamwork and housekeeping will be monitored and will account for 50 lab points.
9. 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.

Three (3) Lecture Midterm Exams and One (1) Lecture Quiz:

1. The dates of the lecture midterm exams and quiz are defined in the Schedule.
2. Midterm and quiz grades will not be dropped and need to be taken on scheduled dates and times.
3. Midterm exam grades will not be dropped. An unexcused missed midterm exam will have a point score of '0/150' points. In the event a student submits a physician letter, or otherwise instructor approved documented reason for an absence resulting in missing one midterm exam, then the Final exam will be weighted as 35% of the total grade. The Final exam score will not compensate in any manner or be adjusted for two missed midterm exams. There is no make-up lecture quiz.
4. There are no extra credit projects or activities that are scheduled for this course. The instructor retains the option of providing an unplanned exercise owing to extenuating circumstances or events.

Final Exam:

1. The Final exam will assess the student's ability to understand the topics, principles and applications that are covered in the course.
2. The Final exam cannot be rescheduled, dropped from the total course grade or substituted.

CHEM 12B SUCCESSFUL LEARNING PRACTICES

Organic chemistry has an historical reputation for being especially challenging for students and the following practices can help you get into a mind frame and study practices to succeed.

Our class necessarily will cover the course content at a rapid pace and requires a focused attention, the implementation of a conducive and comfortable study environment at home or on campus, consistent study practices and an individual resolve and motivation to achieve success.

This is a second-year course at De Anza College with the expectation that students already developed an awareness of how to manage academic challenges when taking either light or heavy STEM course loads. A dedicated attitude combined with motivation certainly helps keep students on track.

You are responsible for your grade in this class. You are encouraged to start and maintain a seriously dedicated strategy for effective study and learning in order to achieve success in the course. Take advantage of group discussions and activities in lectures and labs, attend office hours to assist you with the understanding of the course material, and make peer connections for group study sessions.

Attend and participate in all lectures and labs. This is one of the most important recommendations I can provide. There is a lot of learning actually done during lectures and labs and the best way to learn and keep up with the class is to begin on day one of the course and attend all classes and labs. There will likely be in-class graded activities that will only be administered during the lecture or lab meetings.

1. Read textbook chapters and review lecture presentation materials in advance of class.
2. Participate in class discussions and problem-solving sessions.
3. Ask questions in class to gain clarification and a correct understanding.
4. Prepare for all labs by reading the lab text references in advance of the labs.
5. Identify and establish and maintain a compatible study environment free of distractions
6. If helpful, and it is my recommendation, study with classmates to supplement private study.
7. Keep current with the material and do not accumulate unread chapters or content.
8. Do not attempt to study too much material at any one point.
9. Do not cram before exams – pace your study and problem solving at the class tempo.
10. Try to maintain a healthy lifestyle to facilitate learning and balance school, work and home.

Rules for Safe and Efficient Chemistry Laboratory Operations

Safety Rules:

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. Your laboratory instructor will inform you which of these you must have. Goggles 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.*
9. *Do not taste any chemical reagent.*
10. *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.
11. *Do not pipette solutions by mouth.* Use a rubber suction bulb to fill the pipette.
12. *Do not work with flammable liquids near a flame.*
13. *Do not engage in games or horseplay in the laboratory.* Never run in the laboratory.
14. *Do not attempt unauthorized experiments in the laboratory.*
15. *Do not work in the laboratory in the absence of your instructor or his or her authorized representative.*
16. *Use a fume hood when required.*
17. *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.
18. *When diluting, never pour water into concentrated reagents.* Always pour the reagent into the water.
19. *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.*
20. *Be aware of your neighbors. Are they obeying the safety rules?* A neighbor's accident may injure you.
21. *Avoid touching your face and rubbing your eyes while in the laboratory.* If you must do so, first wash your hands.
22. *Wash your hands before leaving the laboratory.*
23. *Never heat a closed container.* Pressure build up can cause the container to explode.
24. *Assume any chemical is hazardous if you are unsure.*
25. *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.*

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

1) Chemistry Department-approved safety goggles purchased from the De Anza College bookstore (NOT safety glasses) must be worn at all times once laboratory work begins, including when obtaining equipment from the stockroom or removing equipment from student drawers, and may not be removed until all laboratory work has ended, and all glassware has been returned to student drawers.

2) Shoes that completely enclose the foot are to be worn at all times; NO sandals, open-toed, or open-topped shoes, or slippers, even with socks on, are to be worn in the lab

3) Shorts, cut-offs, skirts or pants exposing skin above the ankle, and sleeveless tops may not be worn in the lab: ankle-length clothing must be worn at all times

4) Hair reaching the top of the shoulders must be tied back securely

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: (Continued)

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 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.

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 02:00 PM 03:00 PM By Appointment, In-Person SC2210