

CHEMISTRY12B SYLLABUS

GENERAL INFORMATION Spring 2023

CHEMISTRY12B (CHEM D012B62 CRN 46108)

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

Lecture	Tuesday & Thursday	6:00PM – 7:15PM	Room SC2210
Lab	Tuesday & Thursday	7:30PM – 10:20PM	Room SC2210
Office hours	Tuesday & Thursday	5:00PM – 6:00PM	Room SC2210

Course Description: Course Description: Chemistry 12B is the second quarter of a year-long organic chemistry course sequence for chemistry majors and various pre-professional tracks. The second class in this series is designed to extend the fundamental concepts of organic reactions, stereochemistry, regiochemistry, equilibrium, mechanism, and retrosynthesis to a much broader range of functional groups, including: alcohols, ethers, thiols, sulfides, disulfides, aldehydes, hemiacetals, acetals, ketones, hemiketals, ketals, imines, enamines, hydrazones, and oximes. The synthesis of larger molecules using carbon-carbon bond forming reactions and protecting groups will be presented. The reactivity of conjugated and aromatic compounds such as benzene will also be explored, including a discussion of the extension of molecular orbital theory to delocalized systems. A grade of C or better in Chemistry12A is a prerequisite.

Required Materials:

- ✓ **Text Book:** *Organic Chemistry, 3e*, by David Klein (Inclusive Opt-In Access Included with Class Sign Up)
- ✓ **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)
- ✓ **Carbonless copy Lab notebook:** 100 page carbonless copy spiral bound notebook. ISBN: 1429224541
- ✓ **Standard lock for lab drawer** (or small bike lock) to lock an assigned laboratory drawer.

Recommended:

- ✓ Molecular model kit for organic chemistry – many options available
- ✓ Lab coat, Lab gloves (disposable nitrile or otherwise compatible)

Important Dates: Please note the following dates

- ☑ **Apr 11: Attend the 1st class lecture and your 1st lab session to maintain registration in this course.**
- ☑ **Jun 2: Last day to drop a 12-week class with a grade of 'W'.** <https://www.deanza.edu/calendar/>
- ☑ **Jun 27: Final 6:15PM – 8:15PM.** <http://www.deanza.edu/calendar/final-exams.html>

Classroom Courtesies: 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 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>. All course content is copyrighted and may not be sold or distributed to 3rd party companies or individuals.

Instructional and Student Resources: DeAnza 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.

- **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.

Assessment	Points Each	Total Points	Percent of Total
Lab reports, Pre-labs and technique	100/25/25	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:

- Competency in the lab will be assessed by lab reports, pre-labs, technique and a lab exam.
- 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.
- 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.
- All submitted written work in the lab (i.e., pre-labs and lab reports) must be of the student's original authorship regardless if the lab was performed individually 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.
- A pre-lab assignment is due at the start of the lab lecture and will be collected at that time. A student may not participate in the lab if the pre-lab assignment was not submitted on its due date. Pre-labs contribute 10% (25/250) of the total lab points.
- 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) of the total lab points.
- There will be no (zero) make-up labs. Students must attend each lab lecture in order to participate in each lab.
- 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.
- Competent and efficient lab technique, adherence to safety compliance, self-sufficiency, teamwork and good housekeeping will be monitored and will contribute 10% (25/250) of the lab point score.
- 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:

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

Final Exam:

- The Final exam will cumulatively assess the student's ability to be conversant in the course content and familiarity with the topics that are covered in the class.
- The Final exam cannot be rescheduled, dropped from the total course grade or substituted.
- The Final exam will be given on Tuesday, June 27, 2023 at 6:15PM – 8:15PM.

SCHEDULE CHEM12B Spring 2023 Chad Miller (Lecture & Lab content subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 4/11	CH9: Alkynes: acetylides; preparation, hydrogenation, reduction	Lab check-in. Review: Alkene reactions & synthesis	
1	Thur 4/13	CH9: Reactions; halogenation, HX, hydration; hydroboration; oxidation	NMR and IR spectroscopy and instrumentation	
2	Tues 4/18	CH9: Reactions and synthesis	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	
2	Thur 4/20	Lecture quiz ; CH12: Alcohols: Properties of alcohols; nomenclature, synthesis; Grignard reactions, hydride reductions	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	LECTURE QUIZ
3	Tues 4/25	CH12: Protection & deprotection; OTs; halides using HX, PBr ₃ , POCl ₃ , SOCl ₂ ; oxidations H ₂ CrO ₄ , KMnO ₄ , PCC, Swern	Lab1: Oxidation of cyclododecanol Theory: 585-593 Proc: 593-595	
3	Thur 4/27	CH13: Ethers and thioethers); epoxides; reactivity and synthesis	Lab1. Synthesis strategies 1: alkynes, alcohols, ethers, epoxides	
4	Tues 5/02	Synthesis strategies 1 continued	Lab1. Midterm1 review session	
4	Thur 5/04	Midterm 1	CH19: Aldehydes and ketones: properties, preparation; nucleophilic additions, acetal formation	MIDTERM 1
5	Tues 5/09	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 5/11	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 5/16	CH19: Aldehydes & Ketones synthesis strategies 2	Lab2. Aldehydes and ketones reactions and synthesis strategies 2	
6	Thur 5/18	Midterm 2 review session	Lab3: Grignard reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	
7	Tues 5/23	Midterm 2	Lab3: Grignard reaction (Part A) Theory:715-719,725-727 Proc 719-720, 728-731	MIDTERM 2
7	Thur 5/25	CH16: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control; organocuprates vs Grignard additions	Lab3. CH16: Pericyclic reactions; MO theory; Diels Alder; regioselectivity; transition states and endo vs exo stereochemistry	
8	Tues 5/30	CH16: 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 6/01	Ch16: Synthesis strategies 3; Diels-Alder and pericyclic reactions in synthesis	Lab4: Wittig reaction	
9	Tues 6/06	Ch16: Diels-Alder and pericyclic reactions in synthesis	Lab4: Witting reaction Midterm 3 review session	
9	Thur 6/08	Midterm 3	Lab4. CH17: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	MIDTERM 3
10	Tues 6/13	CH18: Aromatic substitution; EAS; activation-deactivation; directional effects; oxidation & reduction	Lab5: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
10	Thur 6/15	CH18: Friedel-Craft reactions; Nucleophilic aromatic substitution	Lab5: Diels Alder reaction Part A Theory: 421-425 Proc: 426	
11	Tues 6/20	CH18: Friedel-Craft reactions; Nucleophilic aromatic substitution	Check out. Mass spectrometry Lab Exam	LAB EXAM
11	Thur 6/22	Synthesis of substituted aromatic compounds	Final exam review session	
12	Tues 6/27	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) 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.

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 sophomore-level course 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 motivation certainly helps keep students on track.

Come to 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.

Come to office hours and ask your questions or review problems and their solutions. Take advantage of these scheduled opportunities to clarify or enhance your understanding of the course content. Students who accommodate the office hours into their own schedules can greatly benefit.

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 distraction.
6. If helpful, and it is my recommendation, study with classmates to supplement private study.
7. Learn the material as it is presented 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 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 systems

*Increase breadth of knowledge of organic reactions to include functional groups containing oxygen, benzene and more complex systems

*Construct molecular structures of increasingly complex molecules from IR, ^1H NMR, and ^{13}C NMR data

Office Hours:

T,TH 05:00 PM 06:00 PM In-Person SC2210