CHEMISTRY12B SYLLABUS

GENERAL INFORMATION Winter 2020

CHEMISTRY12B (CHEMD012B.03 and CHEMD012B.04) CRN 34851 and CRN36378

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

Lecture	**Tuesday & Thursday**	**10:30AM – 11:45AM**	**Room S35**
Lab (CRN34851)	**Tuesday & Thursday**	**7:30AM – 10:20AM**	**Room SC2210**
Lab (CRN36378)	**Tuesday & Thursday**	**2:30PM – 5:20PM**	**Room SC2210**
Office hours	**Friday**	**10:00AM –12:00PM**	**S43M**

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)
- ✓ *Pushing Electrons, 4e*. Daniel P. Weeks

Important Dates: Please note the following dates

- ☑ ***Jan 7(9):Attend the 1st class lecture and your 1st lab session to maintain registration in this course.***
- ☑ ***Feb 28*: Last day to drop a 12-week class with a grade of 'W'. https://www.deanza.edu/calendar/**
- ☑ ***Mar 26*: Final 9:15AM – 11:15AM. http://www.deanza.edu/calendar/final-exams.html**

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 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

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/studentservices/ to learn more.

- **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 Winter 2020

Assessment	Points Each	Total Points	Percent
Lab reports, pre-labs, technique	105/30/15	150	15%
Lab exam (1)	90	90	9%
Lab quizzes (2)	45	90	9%
Midterms (3)	140	420	42%
Final exam (1)	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 experimental principles will be assessed by a Lab exam and two (2) quizzes.
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 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.
5. 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-lab assignments contribute 20% (30/150) of the point score above.
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. Lab reports (individually weighted) contribute 70% (105/150) of the point score above.
7. There will be no (zero) make-up labs. Time and facilities will not permit rescheduling of labs for students in this course. Students must attend each lab lecture in order to participate in each lab.
8. One lab report representing the student's lowest score of an attended lab (or to be applied to one missed lab) will be dropped. A second missed lab will be scored as "0" points. 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 good housekeeping will be monitored and will contribute 10% (15/150) of the point score above.
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.

Three (3) Lecture Midterm Exams:

1. The dates of the three (3) lecture midterm exams are defined in the Schedule.
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 emergency medical situation or family emergency and is properly documented, the average of the scores of the remaining two midterms that are taken will be 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 thus there is no point contribution of any such activity in lieu of or in addition to any exams or quizzes.

Final Exam:

1. 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 lectures and laboratory.
2. The Final exam cannot be rescheduled, dropped from the total course grade or substituted.
3. The Final exam will be given on March 26, 2020 at 9:15AM – 11:15AM.

SCHEDULE CHEM12B Winter 2020 Chad Miller (Lecture & lab subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 1/07	Syllabus. CH9: Alkynes: acetylides; preparation, hydrogenation, reduction	Check-in & Safety Orientation	
1	Thur 1/09	CH9: Reactions; halogenation, HX, hydration; hydroboration; oxidation CH11: *Synthesis strategies 0.5*	IR/NMR/MS Spectroscopy review and problem solving	
2	Tues 1/14	CH12: Alcohols: Properties of alcohols; nomenclature, synthesis; Grignard reactions, hydride reductions	Lab1: Oxidation of an alcohol (cyclododecanol) **Theory:** 585-593 **Proc:** 593-595	
2	Thur 1/16	CH12: Protection & deprotection; OTs; halides using HX, PBr_3, $POCl_3$, $SOCl_2$; oxidations H_2CrO_4, $KMnO_4$, PCC, Swern	Lab Quiz 1 Lab1: Oxidation of an alcohol – product characterization IR/NMR	Lab Quiz 1
3	Tues 1/21	CH13: Ethers, epoxides, thioethers: synthesis and reactivity	Lab2: Reduction of 9-fluorenone **Theory:** 621-624,651-652 **Proc:** 653	
3	Thur 1/23	*Synthesis strategies 1 and Midterm1 group study session*	Lab2: Reduction of 9-fluorenone	
4	Tues 1/28	MIDTERM 1	Lab2: Reduction of 9-fluorenone	MIDTERM 1
4	Thur 1/30	CH19: Aldehydes and ketones: properties, nomenclature; preparation; nucleophilic additions, acetal formation	Lab2: Reduction of 9-fluorenone	
5	Tues 2/04	CH19: Reactions with amines to form imines & enamines; thioacetals; hydrides; Grignards; cyanohydrins	Lab3: Grignard reaction (Part A) **Theory:**715-719,725-727 **Proc** 719-720, 728-731	
5	Thur 2/06	CH19: Wittig and HWE reactions; Baeyer-Villiger oxidation	Lab3: Grignard reaction (Part A)	
6	Tues 2/11	*Synthesis strategies 2 & Midterm2 group study session*	Lab3: Grignard reaction (Part A)	
6	Thur 2/13	MIDTERM 2	Lab4: Wittig reaction (Part A: Z & E stilbene)	MIDTERM 2
7	Tues 2/18	CH16: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control; organocuprates vs Grignard additions	Lab4: Wittig reaction (Part A: Z & E stilbene)	
7	Thur 2/20	CH16: Pericyclic reactions; MO theory; Diels Alder; regioselectivity; transition states and endo vs exo stereochemistry	Lab Quiz 2 Lab4: Wittig reaction (Part A: Z & E stilbene)	Lab Quiz 2
8	Tues 2/25	CH16: Electrocyclic reactions; orbital symmetry; con- & disrotatory mechanisms; Woodward-Hoffmann rules; sigmatropic rearrangements	Lab5: Kinetic and thermodynamic control Parts A,B,C,E **Theory:** 443-448 **Proc:** 448-450	
8	Thur 2/27	*Synthesis strategies 3 & Midterm 3 group study session*	Lab5: Kinetic and thermodynamic control Parts A,B,C,E	
9	Tues 3/03	MIDTERM 3	Lab5: Kinetic and thermodynamic control Parts A,B,C,E	MIDTERM 3
9	Thur 3/05	CH17: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	Lab6: Diels Alder reaction Part A **Theory:** 421-425 **Proc:** 426	
10	Tues 3/10	CH17: Benzylic oxidation, Birch reduction, radical reactions, substitution reactions	Lab6: Diels Alder reaction Part A	
10	Thur 3/12	CH18: Electrophilic aromatic substitution (EAS), activation-deactivation; directional & substituent effects; EAS X,SO_3,NO_2	Lab7: Freidel-Crafts acylation **Theory:** 499-500,511-513 **Proc:** 513-514	
11	Tues 3/17	CH18: Friedel-Craft alkylation and acylation; Nucleophilic aromatic substitution	Lab Exam Lab7: Freidel-Crafts acylation	Lab Exam
11	Thur 3/19	CH18: Synthesis of substituted aromatic compounds	Lab check-out *Final exam review study session*	
12	Tues 3/26	FINAL EXAM 9:15AM – 11:15AM		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.

CHEM 12B SUCCESSFUL STUDY 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 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 text book 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 class mates 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):

*Apply molecular orbital theory to predict the outcome of selected chemical reactions.
*Apply resonance theory to predict the major and minor products of chemical reactions.
*Generate logical multi-step syntheses of increasingly complex molecules.
*Construct logical stepwise reaction mechanisms for increasingly complex chemical systems.