CHEMISTRY12B SYLLABUS

GENERAL INFORMATION
CHEMISTRY12B (CHEMD012B62) Spring 2018
Instructor: Chad Miller E-mail: millerchad@fhda.edu

Lecture (CRN42677)	**Tuesday & Thursday**	**3:30PM – 4:45PM**	**Room S35**
Lab (CRN42677)	**Tuesday & Thursday**	**11:30AM – 2:20PM**	**Room SC2210**
Office hours	**Tuesday**	**10:00AM –11:00AM**	**S43M**
	Thursday	**5:00PM – 6:00PM**	**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

- ☑ ***Apr 10*: *Attend 4/10 lecture and 4/10 lab session in order to maintain registration in this course.***
- ☑ ***Jun 01*: Deadline to drop a 12-week class with a grade of 'W'**
- ☑ ***Jun 26*: Final Exam date. 4:00PM – 6:00PM Lecture room**

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 Spring 2018

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) periodic 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 documented, the average of the scores of the remaining two midterms will be applied to the missed exam score. There is no accommodation if a second midterm exam is missed; the score 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 June 26, 2018 at 4:00PM – 6:00PM in the lecture room.

SCHEDULE CHEM12B Spring 2018 Chad Miller (subject to change)

Week	Day/Date	Lecture Content	Lab Content	Exam Dates
1	Tues 4/10	Syllabus. CH9: Alkynes: acetylides; preparation, hydrogenation, reduction	Check-in & Safety Orientation	
1	Thur 4/12	CH9: Reactions; halogenation, HX, hydration; hydroboration; oxidation CH11: *Synthesis strategies 0.5*	IR/NMR/MS Spectroscopy review and problem solving	
2	Tues 4/17	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 4/19	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 4/24	CH13: Ethers, epoxides, thioethers: synthesis and reactivity	Lab2: Reduction of 9-fluorenone **Theory:** 621-624,651-652 **Proc:** 653	
3	Thur 4/26	*Synthesis strategies 1 and Midterm1 group study session*	Lab2: Reduction of 9-fluorenone	
4	Tues 5/01	MIDTERM 1	Lab2: Reduction of 9-fluorenone	MIDTERM 1
4	Thur 5/03	CH19: Aldehydes and ketones: properties, nomenclature; preparation; nucleophilic additions, acetal formation	Lab2: Reduction of 9-fluorenone	
5	Tues 5/08	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 5/10	CH19: Wittig and HWE reactions; Baeyer-Villiger oxidation	Lab3: Grignard reaction (Part A)	
6	Tues 5/15	*Synthesis strategies 2 & Midterm2 group study session*	Lab3: Grignard reaction (Part A)	
6	Thur 5/17	MIDTERM 2	Lab4: Wittig reaction (Part A: Z & E stilbene)	MIDTERM 2
7	Tues 5/22	CH16: Dienes & conjugated systems: MO theory; thermodynamic & kinetic control; organocuprates vs Grignard additions	Lab4: Wittig reaction (Part A: Z & E stilbene)	
7	Thur 5/24	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 5/29	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 5/31	*Synthesis strategies 3 & Midterm 3 group study session*	Lab5: Kinetic and thermodynamic control Parts A,B,C,E	
9	Tues 6/05	MIDTERM 3	Lab5: Kinetic and thermodynamic control Parts A,B,C,E	MIDTERM 3
9	Thur 6/07	CH17: Aromaticity; benzene; MO theory; Huckel's rule; Frost circles; heterocycles	Lab6: Diels Alder reaction Part A **Theory:** 421-425 **Proc:** 426	
10	Tues 6/12	CH17: Benzylic oxidation, Birch reduction, radical reactions, substitution reactions	Lab6: Diels Alder reaction Part A	
10	Thur 6/14	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 6/19	CH18: Friedel-Craft alkylation and acylation; Nucleophilic aromatic substitution	Lab Exam Lab7: Freidel-Crafts acylation	Lab Exam
11	Thur 6/21	CH18: Synthesis of substituted aromatic compounds	Lab check-out *Final exam review study session*	
12	Tues 6/26	FINAL EXAM 4:00PM – 6:00PM		FINAL EXAM

CHEM 12B SUCCESSFUL STUDY PRACTICES

Organic chemistry has an historical reputation for being very 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.

[The following laboratory safety and housekeeping guidelines are excerpted from the Chem12 syllabus of Professor Erik Woodbury, DeAnza College.]

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
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.

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.