

Chemistry 12B Organic Chemistry

Spring 2017

Instructor:

- Nada Khouderchah
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- Office hours and location: Tuesday and Thursday from 1:00 – 2:15 pm in the faculty space SC-1 on the second floor.

Sections:

If you are enrolled in this course, you have a lecture period and a laboratory period. There are two sections of lab:

CHEM 12B Section 61 (CRN 42676)

- Lecture: T-Th 6:00 – 7:15 pm MLC105
- Lab Lecture: T-Th 2:30 – 3:20 pm SC2210
- Lab: T-Th 3:30 – 5:20 pm SC2210

CHEM 12B Section 62 (CRN 42677)

- Lecture: T-Th 6:00 – 7:15 pm MLC105
- Lab Lecture: T- Th 7:30 – 8:20 pm SC2210
- Lab: T-Th 8:30 – 10:20 pm SC2210

Course Content:

An exploration of the physical properties and chemical behavior of important classes of organic compounds, focusing on: Polyenes, aromatic compounds, alcohols, thiols, ethers, aldehydes, ketones and their derivatives. Emphasis on retrosynthesis, spectroscopic structure determination and reaction mechanism.

Laboratory experiments 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 class is needed for chemistry majors or those in closely-allied fields such as biochemistry and chemical engineering.

Student Learning Outcome Statements (SLO):

- 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.

Lecture Materials:

1. *Organic Chemistry, 2th edition* by David Klein (Wiley: 2015; ISBN: 978-1-118-45228-8).
2. *Student study guide and Solutions Manual to accompany Organic Chemistry, 2th edition* (Wiley: 2015; ISBN: 978-1-118-64795-0).
3. Molecular modeling set (optional). I like the molecular student set by Molymod.

Lab Materials:

- Gilbert, John C. and Martin, Stephen F.; *Experimental Organic Chemistry: A Miniscale and Microscale Approach, 6th edition* (Thomson Brooks/Cole: 2011; ISBN 9781305080461)
- 8.5 x 11 or 6 x 9 permanently bound **laboratory notebook**.
- A scientific calculator that has at least log and exponential functions (will be used in lecture as well).
- Laboratory safety goggles purchased from the De Anza Book Store. Other types of goggles will not be permitted.
- A combination lock.
- Latex or Nitrile Gloves available from the bookstore.

Attendance and Conduct:

Attendance during lecture, lab lecture, and all laboratory periods are mandatory. Tardiness and leaving before the lecture or laboratory period has ended will not be tolerated. If you miss lecture, laboratory lecture, or a laboratory period for any reason within the first week of class, you will be dropped from the course. Unexcused absences from lab two or more times will result in an automatic "F" grade for the entire course.

Cell phone use during lab or lecture is not allowed. If you need to answer the phone due to an emergency, please do so outside and un-disruptively. Students who don't comply with this

rule will be asked to leave the classroom/lab. Students are responsible for reading and following the Academic Integrity policy outlined in the De Anza College catalog at all times. If a student is caught cheating or plagiarizing at any time on any assignment, exam, or quiz, they will be expelled from the course and will receive a grade of "F." If students are caught assisting in the act of cheating or plagiarizing, they too will receive the same punishment.

Dropping the Course:

If you wish to drop the course, this is YOUR responsibility. If you do choose to drop, you must officially check out of your lab locker. Failure to check out of lab by the scheduled check-out date will result in an administrative fee and a block will be placed on your future registration.

Course Breakdown and Grading Scale: The class is worth 700 pts.

- The lecture part of the class is worth 500 pts.
- There are three exams and one final exam. Each lecture exam is worth 100 pts.
- Lecture exams will test your knowledge on materials covered in lecture, and exercises found at the end of the chapter.
- The final exam is comprehensive and is worth 150 pts.
- There will be at least three announced quizzes during the quarter.
- There are NO Makeup exams or quizzes. If you're going to miss a quiz or an exam please let me know ahead of time.
- An excused exam or a quiz requires a legal document such as a doctor's note.
- Final grades are based on the total points earned and not on the curve.

| Lecture | |
|------------|--------------------|
| Exams | 3 x 100 = 300 pts. |
| Final Exam | 1 x 150 = 150 pts. |
| Quizzes | 50 pts. |
| total | 500 pts. |

The Lab part is worth 200 pts.

| Lab | |
|-----------------|------------------|
| Pre-lab | 5 x 5 = 25 pts |
| Lab report | 5 x 20 = 100 pts |
| Pre-lab quizzes | 5 x 15 = 75 pts |
| Total | 200 pts |

- Grading Scale

| Grading Scale | | | |
|---------------|--------------|-------|--------------|
| Grade | Percentage % | Grade | Percentage % |
| A+ | 98 - 100 | C+ | 75 - 78 |
| A | 92 - 97 | C | 69 - 74 |
| A- | 89 - 91 | D+ | 65 - 68 |
| B+ | 85 - 88 | D | 62 - 64 |
| B | 82 - 84 | D- | 59 - 61 |
| B- | 79 - 81 | F | 0 - 58 |

Lecture Tentative Schedule:

| Week | Day | Sections | Topics | Recommended problems |
|------|----------|-------------|---|--|
| 1 | 04/11/17 | 10.1-10.4 | Introduction to alkynes, nomenclature, acidity of acetylene and terminal alkynes and preparation of alkynes. | 10.35-44, 10.46, 10.53, 10.57, 10.61, 10.68 and 10.72 |
| | 04/13/17 | 10.5-10.11 | Reactions of alkynes and synthetic schemes | |
| 2 | 04/18/17 | 13.1-13.3 | Alcohols: Nomenclature, properties and synthesis | 13.30-13.33, 13.35-13.50 |
| | 04/20/17 | 13.4-13.7 | Alcohols: Synthesis, diols, Grignard reactions and protection of alcohols | |
| 3 | 04/25/17 | 13.8-13.13 | Alcohols: Reactions, oxidation of phenols, synthesis | |
| | 04/27/17 | 14.1-14.5 | Ethers: Nomenclature, preparation and reactions | |
| 4 | 05/02/17 | | Exam I Chapters 10, 12 and 13 | |
| | 05/04/17 | 14.6-14.10 | Epoxides: Nomenclature, preparation and ring opening | 14.30-14.31, 14.37-14.39, 14.41-14.43, 14.47, 14.49-14.51 |
| 5 | 05/09/17 | 14.11-14.12 | Thiols, sulfides and synthesis | |
| | 05/11/17 | 20.1-20.4 | Aldehydes and ketones: Nomenclature, synthesis and introduction to nucleophilic addition reactions | 20.44, 20.45, 20.50-20.53, 20.56, 20.60, 20.61, 20.63, 20.65, 20.66, 20.69, 20.71, 20.75-20.79 |
| 6 | 05/16/17 | 20.5-20.7 | Oxygen and nitrogen nucleophiles. Hydrolysis of acetals, imines and enamines | |
| | 05/18/17 | 20.8-20.12 | Hydrogen and carbon nucleophiles, Baeyer-Villiger oxidation of aldehydes and ketones. Synthesis | |
| 7 | 05/23/17 | 17.1-17.4 | Classes of dienes, conjugated dienes, molecular orbital theory and electrophilic addition | |
| | 05/25/17 | | Exam II Chapters 14 and 20 | |
| 8 | 05/30/17 | 17.5-17.7 | Thermodynamic control vs. Kinetic control, Pericyclic reactions and Diels-alder reactions | 17.32-17.34, 17.40, 17.41, 17.43-17.46, 17.49, 17.55-17.59 |
| | 06/01/17 | 17.8-17.10 | MO description of cycloadditions, electrocyclic reactions and sigmatropic rearrangement | |
| 9 | 06/06/17 | 18.1-8.4 | Aromatic compounds: Nomenclature of benzene derivatives. Structure and stability of benzene | 18.28, 18.29, 18.34-18.38, 18.40-18.44, 18.47, 18.52 |
| | 06/08/17 | 18.5-18.7 | Aromatic compounds, reactions at the benzylic position/Reduction of the aromatic moiety | |
| 10 | 06/13/17 | 19.1-19.5 | Reduction of the aromatic moiety/ Introduction to electrophilic aromatic substitution and halogenation Sulfonation, nitration, Friedel-Crafts alkylation and acylation. | |
| | 06/15/17 | | Exam III Chapters 17 and 18 | |
| 11 | 06/20/17 | 19.6-19.11 | Activating and deactivating groups/Halogens deactivating groups, the directing effect of a substituent and multiple substituents | 19.44-19.50, 19.53, 19.54, 19.56-19.59, 19.67-19.70, 19.72 |
| | 06/22/17 | 19.12-19.15 | Synthesis, nucleophilic aromatic substitution, elimination-addition | |
| 12 | 06/27/17 | | Final exam from 6:15-8:15 pm (Comprehensive) | |

Lab Schedule

| Week | Date | Report due | Theory (page numbers) | Procedure (page numbers) | Topic |
|------|----------|--------------|-----------------------------------|-----------------------------|---|
| 1 | 4/11/17 | | | | Introduction and check-in |
| | 04/13/17 | | 587 - 593 | 593-598 | Lab 1 - Oxidation of an Alcohol (Part A) |
| 2 | 04/18/17 | | 587 - 593 | 593-598 | Lab 1 - Oxidation of an Alcohol (Part A)/ Quiz ch.7, 8 and 9 (Class Textbook) |
| | 04/20/17 | | | | IR/NMR worksheet |
| 3 | 04/25/17 | <i>Lab 1</i> | Recommended Problems: 12.17-12.26 | | Chapter 12 (Class textbook): Synthesis |
| | 04/27/17 | | 621 - 624 | 651 - 653 | Lab 2 - Reduction of 9-Fluorenone |
| 4 | 05/02/17 | | 621 - 624 | 651 - 653 | Lab 2 - Reduction of 9-Fluorenone |
| | 05/04/17 | | 715 - 719 | 719-721 | Lab 3 - Grignard Reaction (Prepare prelab for the following lab session also) |
| 5 | 05/09/17 | <i>Lab 2</i> | 715 - 719 | 719-721 | Lab 3 - Grignard Reaction (Part A) |
| | 05/11/17 | | 715 - 719 | 719-721 | Lab 3 - Grignard Reaction (Part A) |
| 6 | 05/16/17 | | 715 - 719 | 719-721 | Lab 3 - Grignard Reaction (Part A) |
| | 05/18/17 | | 673 - 677 | 678 - 679 | Lab 4 - Wittig Reaction (Part A) |
| 7 | 05/23/17 | <i>Lab 3</i> | 673 - 677 | 678 - 679 | Lab 4 - Wittig Reaction (Part A) |
| | 05/25/17 | | | | To Be Determined |
| 8 | 05/30/17 | | 443 - 448 | 448 - 451 | Lab 5 - Kinetic Vs. Thermodynamic Control (Parts A, B, C & E) |
| | 06/01/17 | <i>Lab 4</i> | 443 - 448 | 448 - 451 | Lab 5 - Kinetic Vs. Thermodynamic Control (Parts A, B, C & E) |
| 9 | 06/06/17 | | 443 - 448 | 448 - 451 | Lab 5 - Kinetic Vs. Thermodynamic Control (Parts A, B, C & E) |
| | 06/08/17 | | 421 - 425 | 426 - 442 | Lab 6 - Diels-Alder Reaction (Part A) |
| 10 | 06/13/17 | <i>Lab 5</i> | 421 - 425 | 426 - 442 | Lab 6 - Diels-Alder Reaction (Part A) |
| | 06/15/17 | | 500 - 502 | 511 - 518 | Lab 7 - Friedel-Craft Acylation (Part A) |
| 11 | 06/20/17 | <i>Lab 6</i> | 500 - 502 | 511 - 518 | Lab 7 - Friedel-Craft Acylation (Part A)/ Lab 7 will be due on 6/27/17 in class before the final exam. |
| | 06/22/17 | | | | Check-out |

Prelabs:

- Pre-labs should be prepared **before** performing the experiment and signed by the instructor otherwise **you will not be allowed to do the experiment and no credit will be given for the lab report as well as the pre-lab.**
- Each lab procedure preparation is worth 5 pts.
- Usually follow the miniscale procedure (unless stated otherwise), and the Lab Notebook section in the syllabus.
- In addition to Google, these two web sites are helpful when looking for the MSDS for chemicals: flinnsci.com and fisherSci.com
- ***There's a prelab quiz before every new experiment. It will be given at the beginning of the lab period.***
- The lowest score of a prelab quiz, prelab and a lab report will be dropped.

Lab Notebook:

- If you have not done so already, please skip the first few pages of your notebook for a table of contents.
- Allot the last 10 pages or so in the BACK of your notebook for a table of hazards.

Table of Hazards:

| Chemical name | Major hazards | Course of action in case a small spill occurred. | Course of action for eye or skin contact. |
|---------------|---------------|--|---|
| | | | |

1. Title of the experiment and the date
2. Your name
3. Purpose: A few sentences outlining what you are trying to do and how you will do it.
4. Reactions and possible side reactions
5. Procedure:

| Procedure: | Observations |
|------------|--------------|
| | |

- Lab notebooks must be written in ink
- All data must be copied directly in the lab notebook.
- Do not use “white-out” in the lab notebook, instead use one line to cross out incorrect data or mistakes.
- Do not copy the procedure from the text book, instead use your own words otherwise it is considered plagiarism.
- Lab notebooks will be checked during lab and will be awarded 1-5 pts depending on completeness.

Useful guideline:

- Lab reports are typed with 1.5 spacing.
- For each section bold-face subheadings
- Do not copy the procedure from the lab textbook, this is plagiarism. Instead use your own words.
- Always use the passive voice (do not use I, he, she, we, us etc.)
 - Example: “0.5 mL of dimethyl maleate was added to the mixture” instead of “I added 0.5 mL of dimethyl maleate to the mixture”
- Always report the amount actually measured (with the appropriate units) and not the amount stated in the procedure
- Always follow the amount of compound with the number of moles (mol) or millimoles (mmol)
 - Example: D-glucose (0.2 g; 0.001 mol) or D-glucose (0.2 g; 1 mmol)
- Yields are not very reproducible. Round off to the closest 1%

Lab Rules:

- OSHA approved safety goggles must be worn at all times
- No food, drinks or smoking are allowed
- Closed toe shoes must be worn. No bare feet or thong sandals are allowed.
- Clothes covering the skin must be worn or a lab coat
- Know the location of fire extinguisher, safety equipment, and the nearest exit
- Do not use broken or cracked glassware
- Always use a brush and dust pan to sweep up broken glassware
- Never taste or smell chemicals
- Avoid contact of chemical with skin. The use of rubber glove is recommended
- Dispose of chemical waste as directed by instructor
- Clean your work area before leaving
- Chemicals should never be taken back to your lab bench. They must be kept in the fume hood in their proper storage containers.
- Never leave a chemical bottle or waste container uncapped
- If a chemical spill occurs, notify the instructor immediately.
- If you come into contact with a chemical, flush the affected area with water immediately for 15 minutes. Depending on the degree of contact with the chemicals and the location

the body, you may need to do this in the sink or safety shower. When using the safety shower you must remove the clothing over the area that has come into contact with the chemical. The instructor will ask the other students in the class to leave the room for privacy.

- If your clothing or hair catches on fire use the safety shower immediately. If this is not possible “stop-drop and –roll”.
- If you are hurt or think that you have come into contact with a chemical, notify the instructor immediately (or send a lab partner to fetch the instructor) while following proper safety procedure.
- If you are pregnant or think you are pregnant, it is your responsibility to consult with your physician before taking this course and performing the laboratory experiments.
- At the end of the lab session, check out with the instructor and wash your hands

Important Points:

- If you miss the first week of lab, you will be dropped from the course and your locker will be inspected and may be reassigned to another student. You will be held responsible for any broken or missing lab equipment prior to reassignment.
- If you drop the class, it is your responsibility to officially check out of your lab locker. Failure to do so will result in an administrative fee and a block will be placed on your future registration.
- Two or more unexcused absences from lab sessions will result in an automatic grade of “F” for the entire course.
- If the absence was due to a medical or nonmedical emergency, then it will be an excused absence only with written documentation. Make sure to contact the instructor as soon as possible.
- There are no make-up labs. If you did not perform an experiment due to an unexcused absence, your grade for that lab report will be zero. It is your responsibility to learn the theory, and know how to use the chemicals and equipment in the missed experiment.
- If you missed an exam due to an unexcused absence, your grade for that exam will be zero.
- There are No make-up exams or quizzes.
- For every two lab reports that are not turned in, your grade will be dropped by one letter grade.
- Do not copy data, calculations or phrases from lab textbook, internet or other students this is considered plagiarism and cheating. Plagiarism will be penalized following De

Anza's policy regarding academic dishonesty and will be reported to the office of Instruction.

- No late reports will be accepted.
- The ringer on all cell phones needs to be turned off during lab period.
- Notify the instructor if you need to leave the lab for any reason.
- Misbehavior in the lecture and lab classroom will not be tolerated. Any student who behaves in an inappropriate manner will be asked to leave the classroom. If that behavior gets repeated a second time, the student will be reported to the Vice President of Instruction for disciplinary action.
- *The instructor reserves the right to modify and adjust the schedule and the grading scale as needed.*

Additional information:

If there are any students that need assistance due to a disability, please feel free to discuss with me any needs in private. Also contact, Disability Support Program and Services located in S41 to assist with any needs if verification/documentation of needs is available.

In case of an emergency, we will all evacuate to the emergency assembly area for our classroom. Make sure to carry your belongings with you and stay with the class until I or an official give further directions. Call 911 in case of an emergency. The student health services are also available at 408-949-6109.

Contact the director of human resources at Foothill-De Anza college district, human resources department at 650-949-6109 if you want to make any complaints regarding unlawful discrimination or sexual harassment.