

Chemistry 12B: Organic Chemistry

Winter 2009

Instructor:

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Chemistry 12B Web Site:

<http://nebula2.deanza.edu/~muzzi>

Sections:

CHEM 001A -01

Lecture: MWF 7:30AM-8:20AM, SC1102
Lab Lecture: MW 11:30AM-12:20 PM, SC2210
Lab: MW 12:20PM-2:00PM, SC2210

CHEM 001A -02

Lecture: MWF, 7:30AM-8:20AM, SC1102
Lab Lecture: TTH 7:30 AM-8:20AM, SC2210
Lab: TTh, 8:20 AM-10:00 AM, SC2210

Course Format:

This class is divided into three separate instructional periods: a **lecture period** devoted to the primary course material; a supplementary **lab lecture period** focusing on experimental techniques; and a **lab period** for conducting lab experiments. One registration code automatically enrolls you in all three periods. Everyone will have the same lecture period, but a different lab lecture and lab period depending on which code you used for enrolling. **At De Anza College the lab and lecture cannot be taken as separate courses under any circumstances. Once you are enrolled you may not switch lab lecture or lab periods whether on a temporary or on-going basis.**

Course Description:

Lecture: This second quarter of a three-quarter organic chemistry sequence is designed to extend the fundamental concepts of organic reactions – stereochemistry, regiochemistry, equilibrium, mechanism, and retrosynthesis – to a broader range of functional groups, including: alcohols, ethers, thiols, aldehydes, ketones, imines, and enamines. The synthesis of larger molecules using carbon-carbon bond forming reactions and protecting groups will be presented. The reactivity of conjugated and aromatic compounds will also be explored, including a discussion of the extension of molecular orbital theory to delocalized systems.

Lab: To compliment the lectures, a series of laboratory experiments will include the synthesis of several small organic molecules, using standard instrumental techniques – including gas chromatography (GC), infrared spectroscopy (IR), and nuclear magnetic resonance spectroscopy (NMR) – to confirm their formation. Key reaction include the oxidation of an alcohol, the reduction of a ketone, a Wittig reaction, a Grignard reaction, a Diels-Alder reaction, and a Friedel-Crafts acylation.

Office Hours:

MWF 8:30 AM –9:30 AM
TTH 10:30-11:30AM

Please feel free to drop by outside of these times or to make an appointment. My door is always open and I have included my teaching schedule on page 7.

Required Materials:

1. Solomons, T.W. Graham and Fryhle, Craig B.; *Organic Chemistry*, 9th edition; (J. Wiley and Sons, 2007; ISBN: 978-0-471-68496-1)
2. Gilbert, John C. and Martin, Stephen F.; *Experimental Organic Chemistry: A Miniscale and Microscale Approach*, 4th edition (Thomson Brooks/Cole: 2006; ISBN 0-495-01334-X)
3. Fisher, G; *Chemistry 12B Notes*, 3rd edition. Please see Dr. Fisher to purchase this item.
4. 8.5 x 11 or 6x9 permanently bound **laboratory notebook with carbon copies**.
5. **Laboratory safety goggles (OSHA) approved by the De Anza Chemistry Department**. You must purchase the goggles at the bookstore. No other goggles will be permitted.
6. A **combination** lock for your laboratory locker.
7. **Latex or Nitrile Gloves** available from the bookstore.

Recommended Materials:

1. Solomons, T.W. Graham and Fryhle, Craig B.; *Organic Chemistry (9th edition) Student Study Guide and Solutions Manual*; (J. Wiley and Sons, 2007; ISBN: 978-0-470-05098-9) (**Recommended only**)
2. Organic Chemistry Modeling Kit (**Recommended only**). You do not need to purchase the one from the bookstore. Any O-chem modeling kit will do.
3. A scientific calculator that has at least log and exponential functions is required (~ \$12). Graphing capabilities are not necessary.

Registration, Attendance, and Conduct Policy:

Registration: Due to safety concerns, enrollment in each section is strictly limited to 28 students per section. Class spaces are filled in accordance with the official class roster from Admission and Records, followed by the official wait list. Any errors with registration or status must be addressed directly to Admission and Records. Please note that if you are placed in a section from the wait list, you will not be assigned a laboratory locker or be allowed to perform experiments until you are **officially** enrolled in the class.

Attendance: Attendance is expected during all lectures, all lab lectures, and all laboratory periods. Students are expected to be prompt and to leave only when lecture or lab is concluded. Arriving late to lecture is disruptive to the class and **strongly** discouraged. **If you miss lecture, laboratory lecture, or a laboratory period for any reason within the first two weeks of class, you will be dropped from the course.**

Dropping the Course:

If you choose to drop the course **at any point** during the quarter, it is **your** responsibility to withdraw through Admissions and Records by the appropriate deadline. You are required to officially check out of your lab locker whether you remain in the course or drop the course. 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.

OTHER IMPORTANT POINTS:

YOU MUST BRING A COMBINATION PAD LOCK TO YOUR LAB SECTION ON THE FIRST DAY OF LAB. IF YOU FAIL TO BRING A LOCK YOU WILL BE DROPPED FROM THE COURSE.

IF YOU MISS LABORATORY LECTURE OR A LABORATORY PERIOD FOR ANY REASON WITHIN THE FIRST WEEK OF CLASS, YOU WILL BE DROPPED FROM THE COURSE. THREE OR MORE UNEXCUSED ABSENCES FROM LAB WILL RESULT IN AN AUTOMATIC “F” FOR THE ENTIRE COURSE.

IF YOU ARE DROPPED FROM THE COURSE DURING THE FIRST WEEK OF CLASS, 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. YOU MUST ALSO STILL CHECK OUT OF YOUR LAB LOCKER TO AVOID AN ADMINISTRATIVE FEE AND A REGISTRATION BLOCK.

Conduct: **The ringer on all cell phones and beepers must be turned off during lecture and lab periods.** Please only answer your cell phone if it is an emergency. Please notify me if you need to leave the lab for any reason. Students are also expected to abide by the Academic Integrity Policy as outlined by De Anza College. Students caught cheating or plagiarizing on any assignment will be expelled from the course and receive a grade of “F.” If collusion between students to cheat can be demonstrated, each student will receive this same penalty.

Last day to drop for a refund: January 16th

Last day to drop with no record of grade: January 24th

Last day to request P/NP: January 30th

Last day to drop with a “W”: February 28th

Holidays: January 19th and February 13th -16th

Class Format:**Grading and Exam Schedule (Exam dates are tentative):****Lecture:**

Quizzes (5 quizzes/ 25 pts each. Lowest quiz score dropped)	100 pt
Exams: (3 exams/150 points each. Lowest exam score dropped)	300 pt
Final Exam (This score will not be dropped under any circumstances)	<u>300 pt</u>
	700 pt

Lab:

Laboratory Experiments/Reports (8 reports/10 pt each. Lowest report score dropped)	70 pt
Laboratory Manual Preparations (8 lab preps/ 5 pt each. Lowest prep score dropped)	35 pt
Laboratory Exam (This score will not be dropped under any circumstances)	75 pt
Laboratory Final (This score will not be dropped under any circumstances)	<u>120 pt</u>
	300pt

Total Points Available for the Course: **1000 pt**

<u>Grade Scale:</u>	<u>% of Total Points Possible</u>	<u>Grade</u>
	98-100	A+
	94 - 97	A
	90 - 93	A-
	85 - 89	B +
	80- 84	B
	75 - 79	B-
	70 - 74	C +
	65 - 69	C
	60 - 64	D +
	55 - 59	D
	50 - 54	D-
	49% and less	F

Dr. Muzzi reserves the right to change exam and quiz dates as well as modify the grade scale and total number of course points at any point during the quarter. You will be notified if any changes are made.

Homework and Study Strategies:

Reading and homework are suggested, but homework will not be collected or graded. You're here because you want to be, right? Here are some study strategies.

- 1) **Read** the appropriate chapter sections carefully **BEFORE** coming to class. Not every detail will be covered in lecture, but you are still expected to understand the whole chapter. Seeing the material ahead of time helps make lecture more understandable and you can spend time picking up the finer points rather than stressing about understanding the whole topic for the first time.
- 2) As you read the chapter, do the in-chapter "**Review Problems**" and "**Study Problems.**" This reinforces the material that you have just read. Reading the information alone will not help you learn the material. You must use the information and apply it in order to start making connections and reinforcing the material.
- 3) For O-chem it is recommended that you complete all the end of chapter problems. This seems like a lot, but the key is: **PRACTICE, PRACTICE, PRACTICE. Try and do a few problems each and every day.** Start with the "**Exercises**" and continue on to the "**Problems**" and "**Challenge Problems.**" Being able to do the challenge problems is crucial. Exam questions will be at least at the same level as the challenge problems with one or two more difficult problems to really test your understanding. Some of the answers to these problems can be found at the back of the text. The student Student Study Guide contains the answers to all of the problems.

- 4) Make sure you can do all of the textbook problems **comfortably** before an exam. Try to first do these problems without looking at the solutions. This is very important since you will not have a solutions manual on an exam!! **Educational research tells us that it is just as important for your brain to see mistakes as it is for your brain to figure out the correct pathway. It also tells us that you must see the same information at least three times within 48 hours in order to retain that information.**
- 5) A unique feature to the Solomons' text is the **"Learning Group Problems."** These problems are designed to be worked in a study group. We will sometimes do these problems in class, but not always so it is helpful if you join a **study group**. This is one of the best study strategies you can employ. Please sign up for one during the first day of class (see my website also). If you can explain problems/information to others, then you really know it yourself! You can even hold your study sessions right outside of my office if you want immediate help.
- 6) Getting one-on-one help is also invaluable. **Come to office hours.** Even if you think you don't have any questions, you can just sit and do some homework. While you are doing it, you might find that clarification on certain points really helps. Or, if you have become really confused or fallen behind and don't know what questions to ask, don't let that stop you from coming to office hours. I know which questions to ask you, and we can start from there to try and bring you up to speed. Office hours are also a great way to get to know you (and you to know me), so that if you need letters of recommendation later on, I can write an excellent one for you.
- 7) Where possible make flash cards. Chemistry is pretty much based on positive and negative things getting together (you'll see), but still, there is a lot to memorize. The vocabulary and information you need to have handy (at the edge of your brain) in O-chem is enormous. So when you can, make flash cards. I'll point out good places to do this, but you can start by making ones for functional groups and pKa's of different acids. There are commercial flashcards available, but the process of making the flash cards helps reinforce the information and is a good study technique.

Lecture Quizzes:

There will be **5 lecture quizzes**. Each quiz will be given at the beginning of class and will be about 15-20 minutes long. **Quizzes will be unannounced.** No, this isn't to be cruel! Keeping the quizzes unannounced helps make certain that you are always on top of the reading and homework. **Avoid cramming.** Cramming in O-chem is a death sentence. It's really not possible to do this and be successful in the class. Doing the reading, working on problems, and meeting with your study group on a regular basis makes the information more digestible and helps move the information from your short term memory to your long term memory.

The quizzes will be essay/short answer type questions as well as problem solving/synthesis type problems. The quizzes are designed to test your understanding of the concepts presented in class, in the reading, and from the homework. They will also give you an idea of what the exams will be like.

Each quiz is worth 25 points and only your top 4 quiz scores will count as part of your overall course grade. No early, late or make-up quizzes will be given.

Lecture Exams and Final Exam:

There are **3 lecture exams and 1 final exam**. Material covered in lecture, in the reading, and in the homework will be on the exam. Make sure you can do **all** the homework without struggling. Exam questions will always include questions that are **similar** (this means not exactly the same!) to homework problems. In addition there will be conceptual questions and at least **a few questions that will challenge your understanding of the material (meaning you may have never seen this type of problem in the homework)**. Remember that science is not regurgitation. In your professional life you will need to be able to take your knowledge and apply it to unknown situations. An exam that challenges you, helps to prepare you for the real world.

Each lecture exam is worth 150 points. Only your top 2 lecture exam scores will count as part of your overall course grade. No early, late, or make-up exams will be given.

The final exam will be cumulative. You are allowed to drop a low lecture exam score, but remember that you will see the same subjects on the final exam. Here is your chance to illustrate that you have the material down

and are ready to move on to the next course. The final exam is a third of your grade so always make sure you go back and take a look at the areas where you had problems in the lecture exams.

The final exam is cumulative and is worth 300 points. The final exam is not one of the exam scores that may be dropped out of your overall course score. No early, late, or make-up final exams will be given.

If you feel that any of your exams are graded incorrectly, you are always welcome to turn the exam in for a **complete re-grade of the entire exam at the end of the lecture or laboratory period on the day the exam is passed back.**

Laboratory Notebooks:

You are required to maintain a bound laboratory notebook with carbon copies. Each experimental preparation/procedure must be written in your lab notebook **prior** to performing the experiment. If the prep is not complete at the time the experiment starts, you will not be allowed to perform the experiment and will subsequently lose all the points associated with that experiment. Guidelines for maintaining your laboratory notebook and the grading of your procedures will be given to you during the first laboratory session.

There are 8 laboratory preparations/procedures each worth five points. Only your top 7 laboratory notebook procedure scores will count toward your overall course grade.

Laboratory Lecture

Students are expected to attend **all** laboratory lectures and **all** laboratory sessions. You must complete **all** of the laboratory experiments, and you must also participate in the **entire** laboratory session in order to receive credit for both the laboratory prep/procedure and the laboratory report. Most labs are broken up into two-three lab periods. You must participate in all the assigned lab periods to receive full credit for the report.

There are no make-up labs. If you are unexcused from a lab period or fail to perform any part of a laboratory experiment, you will receive zero credit for the corresponding lab report. It is also your responsibility to understand the theory and use of the chemicals and equipment for any laboratory period that you miss in order to be prepared for the laboratory exam and final. **If you have a medical emergency or some other emergency that prevents you from attending lab, you will be asked to supply written documentation in order for the absence to be excused. Be sure to contact your lab instructor as soon as possible if you miss a lab session.**

If you miss laboratory lecture or a laboratory period for any reason within the first week of class, you will be dropped from the course. Three or more unexcused absences from lab sessions will result in an automatic grade of "F" for the entire course. Please see page 2 for additional details.

Laboratory Reports:

Guidelines for writing a laboratory report will be provided during the first laboratory session. Laboratory reports are generally due one week after completing the experiment (see the lab schedule on page 9.)

There are 8 laboratory reports each worth 10 points. Only your top 7 scores will count as part of your overall course grade. No make-up labs or late lab reports will be allowed.

Without exception all laboratory reports must be typed. Lab reports should be in your own words. Copying data, calculations, phrases or paragraphs from another student or the web is considered plagiarism.

Laboratory Exam and Final

There is **1 lab exam** for this course and **1 lab final**. The lab exam is worth 75 points and the final is worth 120 points. The laboratory exam will be given during your regularly assigned laboratory sessions. The date for the exam will be announced two weeks prior to administering the exam. The date for the final is listed in the syllabus (see the lab schedule).

Both the lab exam and lab final count toward your overall course grade. No early, late or make-up lab exam/final will be given.

DR. CINZIA MUZZI

OFFICE: SC1224

PHONE: 408-864-5790

Monday	Tuesday	Wednesday	Thursday	Friday
Chem 12A Lecture SC 1102 7:30-8:20AM	Chem 12A-02 Lab Lecture SC 2210 7:30 AM-8:20 AM	Chem 12A Lab Lecture SC 1102 7:30-8:20AM	Chem 12A-02 Lab Lecture SC 2210 7:30 AM-8:20 AM	Chem 12A Lab Lecture SC 1102 7:30-8:20AM
Office Hours 8:30-9:30AM SC 1224	Chem 12A-02 Lab SC 2210 8:20-10:00 AM	Office Hours 8:30-9:30AM SC 1224	Chem 12A-02 Lab SC 2210 8:20-10:00 AM	Office Hours 8:30-9:00AM SC 1224
	Office Hours 10:30-11:30AM SC 1224		Office Hours 10:30-11:30AM SC 1224	
Chem 12A-01 Lab Lecture SC 2210 11:30 AM-12:20PM		Chem 12A-01 Lab Lecture SC 2210 11:30 AM-12:20PM		
Chem 12A-01 Lab SC 2210 12:20-2:00PM		Chem 1A-01 Lab SC2210 12:20-2:00PM		

DR. M'S OFFICE HOURS:

MWF 8:30-9:30 AM SC 1224

TTh 10:30-11:30 AM SC 1224

Tentative Lecture Schedule

A Few Notes:

1. This is a tentative schedule. The sections are assigned so that you may read ahead of what will actually be covered in lecture.
2. Depending on where we are in lecture, exam dates may change. Usually if an exam date is changed it will be moved back, but not forward unless there are unforeseen circumstances. You are responsible for reading all of the fine details in a chapter even if they are not covered in lecture.
3. Additionally, there are a couple of points within the quarter where I will ask you to skip ahead and read a few sections from chapters that we will be covering more thoroughly later on in the quarter. This is to help provide a deeper understanding of the current topic and/or to also help with preparation for a given laboratory session.
4. Although Chapter 9 is not listed on the syllabus, NMR spectroscopy is utilized through out the Chem 12 sequence. It is expected that you will review Chapter 9 thoroughly. There will also be presentations of Chapter 9 topics in lab, so please make sure you read this chapter immediately and practice some of the end of chapter problems!

Week	Day	Sections	Topic
1	1/5	11.1-11.4	Chapter 11: ALCOHOLS AND ETHERS
	1/7	11.5-11.9	Chapter 11: ALCOHOLS AND ETHERS
	1/9	11.10-11.14	Chapter 11: ALCOHOLS AND ETHERS
2	1/12	11.15-11.17	Chapter 11: ALCOHOLS AND ETHERS
	1/14	12.1-12.3	Chapter 12: ALCOHOLS II
	1/16	12.4-12.6	Chapter 12: ALCOHOLS II
3	1/19		HOLIDAY
	1/21	12.7-12.8	Chapter 12: ALCOHOLS II
	1/23	12.9	Chapter 12: ALCOHOLS II
4	1/26		Exam 1
	1/28	13.1-13.4	Chapter 13: CONJUGATED UNSATURATED SYSTEMS
	1/30	13.5-13.7	Chapter 13: CONJUGATED UNSATURATED SYSTEMS
5	2/2	13.8-13.11	Chapter 13: CONJUGATED UNSATURATED SYSTEMS
	2/4	14.1-14.4	Chapter 14: AROMATIC COMPOUNDS
	2/6	14.5-14.7	Chapter 14: AROMATIC COMPOUNDS
6	2/9	14.8-14.11	Chapter 14: AROMATIC COMPOUNDS
	2/11	15.1-15.4	Chapter 15: REACTIONS OF AROMATIC COMPOUNDS
	2/13		HOLIDAY
7	2/16		HOLIDAY
	2/18	15.5-15.7	Chapter 15: REACTIONS OF AROMATIC COMPOUNDS
	2/20	15.8-15.10	Chapter 15: REACTIONS OF AROMATIC COMPOUNDS
8	2/23	15.11-15.13	Chapter 15: REACTIONS OF AROMATIC COMPOUNDS
	2/25	15.14-15.16	Chapter 15: REACTIONS OF AROMATIC COMPOUNDS
	2/27		Exam 2
9	3/2	16.1-16.4	Chapter 16: ALDEHYDES AND KETONES I
	3/5	16.5-16.8	Chapter 16: ALDEHYDES AND KETONES I
	3/7	16.9-16.10	Chapter 16: ALDEHYDES AND KETONES I
	3/9	16.11-16.14	Chapter 16: ALDEHYDES AND KETONES I

10	3/11 3/13	17.1-17.3 17.4-17.6	Chapter 17: ALDEHYDES AND KETONES II Chapter 17: ALDEHYDES AND KETONES II
11	3/16 3/18 3/20	17.7-17.8 17.10	Chapter 17: ALDEHYDES AND KETONES II Chapter 17: ALDEHYDES AND KETONES II Exam 3
12	3/23 3/27		Special Topics C and D Final Exam (Cumulative) 7:00AM-9:00AM

Tentative Laboratory Schedule M/W

A Few Notes:

1. Generally we will be using the Gilbert text to guide the procedures used in the laboratory for each experiment. There are two sections listed below: **Theory and Procedure** provide pages from the Gilbert text that you will need to read for each lab. The Theory section must be read prior to performing the experiment so you have an understanding of what you will be doing and why you will be using certain techniques. The **Procedure** portion is the actual procedure you will be following. It is this section that should be prepped in your lab notebook.

2. As stated above there will usually be several sections within the Gilbert text (see below) that will be assigned. You will also be assigned reading from the Solomons' text when additional background information is needed in order to perform the experiment. This reading will be assigned in lab prior to the start of the experiment.

Week	Day	Topic	Theory	Procedure
1	M 1/5	Intro/Safety/Check In		
	W 1/7	Lab 1-Oxidation of an Alcohol	525-530	531-532
2	M 1/12	Lab 1-Oxidation of an Alcohol	525-530	531-532
	W 1/14	Lab 2: Reduction of 9-Fluorenone	551-553	570-571
3	M 1/19	HOLIDAY		
	W 1/21	Lab 2: Reduction of 9-Fluorenone	551-553	570-571
4	M 1/26	Lab 3: Wittig Reaction	585-589	590-591
	W 1/28	Lab 3: Wittig Reaction	585-589	590-591
5	M 2/2	Lab 4: Grignard Reagent	633-635	636-637
	W 2/4	Lab 4: Grignard Reagent	633-635	636-637
6	M 2/9	Lab 4: Grignard Reagent	633-635	636-637
	W 2/11	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
7	M 2/16	HOLIDAY		
	W 2/18	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
8	M 2/23	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
	W 2/25	Lab 6: Diels-Alder Reaction	411-415	416
9	M 3/2	Lab 6: Diels-Alder Reaction	411-415	416
	W 3/4	Lab 7: Friedle-Crafts Acylation	493-495	495-496
10	M 3/9	Lab 7: Friedle-Crafts Acylation	493-495	495-496
	W 3/11	Lab 8: Nitration of Bromobenzene	502-504	504-507
11	M 3/16	Lab 8: Nitration of Bromobenzene	502-504	504-507
	W 3/18	Lab 9: Electrophilic Aromatic Substitution	511-513	514-515
12	M 3/23	Lab Final/Check Out		

Tentative Laboratory Schedule T/Th

A Few Notes:

1. Generally we will be using the Gilbert text to guide the procedures used in the laboratory for each experiment. There are two sections listed below: **Theory and Procedure** provide pages from the Gilbert text that you will need to read for each lab. The Theory section must be read prior to performing the experiment so you have an understanding of what you will be doing and why you will be using certain techniques. The **Procedure** portion is the actual procedure you will be following. It is this section that should be prepped in your lab notebook.

2. As stated above there will usually be several sections within the Gilbert text (see below) that will be assigned. You will also be assigned reading from the Solomons' text when additional background information is needed in order to perform the experiment. This reading will be assigned in lab prior to the start of the experiment.

Week	Day	Topic	Theory	Procedure
1	M 1/6	Intro/Safety/Check In		
	W 1/8	Lab 1-Oxidation of an Alcohol	525-530	531-532
2	M 1/13	Lab 1-Oxidation of an Alcohol	525-530	531-532
	W 1/15	Lab 2: Reduction of 9-Fluorenone	551-553	570-571
3	M 1/20	Lab 2: Reduction of 9-Fluorenone	551-553	570-571
	W 1/22	Lab 3: Wittig Reaction	585-589	590-591
4	M 1/27	Lab 3: Wittig Reaction	585-589	590-591
	W 1/29	Lab 4: Grignard Reagent	633-635	636-637
5	M 2/3	Lab 4: Grignard Reagent	633-635	636-637
	W 2/5	Lab 4: Grignard Reagent	633-635	636-637
6	M 2/10	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
	W 2/12	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
7	M 2/17	Lab 5: Kinetic vs. Thermodynamic Control	435-440	440-443
	W 2/19	TBA		
8	M 2/24	Lab 6: Diels-Alder Reaction	411-415	416
	W 2/26	Lab 6: Diels-Alder Reaction	411-415	416
9	M 3/3	Lab 7: Friedle-Crafts Acylation	493-495	495-496
	W 3/5	Lab 7: Friedle-Crafts Acylation	493-495	495-496
10	M 3/10	Lab 8: Nitration of Bromobenzene	502-504	504-507
	W 3/12	Lab 8: Nitration of Bromobenzene	502-504	504-507
11	M 3/17	Lab 9: Electrophilic Aromatic Substitution	511-513	514-515
	W 3/19	Lab Final/Check-Out		

Partial List of Laboratory Safety Procedures

(Additional Information is found in the Laboratory Manual p.1-11)

- Students must comply with all safety procedures and precautions when attending a laboratory session.
- There are no provisions for making up a lab; therefore, you are expected to attend all scheduled lab sessions.
- You must have your laboratory procedures written prior to starting an experiment. Lab notebooks will be checked during lab and will be awarded between 1-5 points depending on completeness.
- Laboratory notebooks **must be written in ink** and all data must be written in the laboratory notebook. Scraps of paper containing data will be confiscated. Do not use “white-out.” Use one line to cross out incorrect data.
- Lab lecture will consist of a discussion concerning safety for the experiment being conducted that day as well as information regarding experimental techniques.
- Eating and drinking is not permitted in the lab. **Do not bring food or drinks to the lab even if they are in closed/sealed containers. This includes bottled water and chewing gum!!!!!!**
- 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.
- You must wear OSHA approved safety goggles and gloves at **all times** while in the laboratory. Failure to comply with this rule will result with your being expelled from the course and receiving a grade of “F.”
- Appropriate attire must be worn in the laboratory. Shorts, open toed-shoes, and sleeveless shirts (“spaghetti straps”) are **not** considered safe clothing for the laboratory. Clothing made of natural fibers are less of a hazard than those made of synthetic fibers.
- Do not begin the laboratory experiment (e.g. place any chemicals or glassware on the lab benches, turn on Bunsen burners, etc.) until the safety introduction is complete and everyone is wearing their goggles and gloves. The instructor will let you know when it is time to begin the experiment.
- In some cases it will be necessary for the instructor to examine your “set up” before you begin the experiment. In these instances, the instructor will inform you of proper procedures at the beginning of class.
- 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 chemical and the location on 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.
- You will be wearing safety goggles at all times, but should you get a chemical in your eye, flush your eyes in the eye wash for at least 15 minutes.
- 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 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 procedures.
- Know where the eyewash, safety shower, and fire extinguishers are located. (You should be able to do this with your eyes closed!)
- Chemicals should never be taken back to your lab bench. They must be kept in the fume hood in their proper storage containers. All chemicals and waste bottles must be capped after use. **Never** leave a chemical bottle or waste container uncapped.
- If a chemical spill occurs, notify your instructor so that she may help you follow the proper measures for cleaning up chemical spills.

- All waste must go into appropriate waste containers. Never throw anything down the sink or in the regular trash receptacles.
- Never pick up broken glass with your hands. Always use a brush and dust pan to sweep up broken glassware.
- If at any time the instructor feels that you are being unsafe and have not followed proper safety precautions and procedures, you will be asked to leave the lab, and you will receive zero credit for the laboratory report and notebook. You may also be expelled from the course and receive a grade of “F.”
- After completing an experiment clean up your lab space as well as glassware. Return all cleaned glassware and other equipment (e.g. Bunsen burners, clamps, steel rods, etc.) to the appropriate cupboards or stockroom.
- After you have completed an experiment and cleaned up your bench space and glassware, check out with the instructor.
- Remember to wash your hands immediately after completing the experiment and checking out. Also, change your clothes as soon as possible. This is especially important if you have children.
- Lab reports are due **one week after the completion** of each experiment. **No late** lab reports will be accepted and all lab reports must be type written.

Guidelines Used for Maintaining a Lab Notebook

The following outline indicates the minimum amount of information that should appear in your notebook. On occasion it may be necessary to include additional information in the notebook.

* Indicates the material that must be completed **before** the start of each new experiment. The instructor will check this at the beginning of each new experiment.

** Indicates the material that must be collected/completed **during** the lab session.

For the Notebook in General:

*Personal Identification:

Write your name on the outside cover of your notebook and include personal contact information on the inside cover of your notebook in case you should lose or forget your lab book.

*Table of Contents:

The beginning of your lab notebook should contain a table of contents with the title of each experiment and the page number for each experiment. The table of contents may be updated as you complete each experiment.

For Each Laboratory Experiment:

*Title and Date:

Each experiment should begin with the title of the experiment and the date it is performed.

*Abstract:

Each experiment should also contain a brief summary that describes the main purpose of the experiment. A short description of the experimental techniques used and any pertinent **mathematical and chemical equations** should be included here.

*Table of Reagents/Products/Hazards:

You should complete this table before each new experiment is started by using the appropriate MSDS sheets. Although this table usually includes physical constants for each reagent used in the experiment, you will use this table primarily for safety and hazard information. Safety and hazard info usually includes LD50's, toxicities, and or information regarding physical contact with the chemical.

*Experimental Procedure:

The procedure is a detailed description of how the data is to be obtained. Use a two columned format. In the left hand column you should include a step-by-step procedure that is outlined in the laboratory manual; however, **do not** copy straight from the manual. The procedure should be in your own words so that you have a complete understanding of how the experiment will be performed. **A complete stranger should be able to pick up your notebook and follow the procedure.** The right hand column should be used for recording observations as well as any deviations from the planned procedure (see below)

**Observations:

Observations are just as important as measurements. You should note any color changes, bubbles, instrumentation problems, etc. in the right hand column next to the procedural steps.

**Data Tables:

These tables should include all measurements taken. Measurements should have the appropriate number of significant figures and the correct units (without exception). A guideline for organizing these tables can often be found at the end of the laboratory experiment in the laboratory manual, but they do not have to be exact replications of what is found in the laboratory manual and you can write these out as you collect data.

Guidelines for Laboratory Reports

The following outline indicates the minimum amount of information that should appear in your report. On occasion it may be necessary to include additional information in the report. All reports must be type written.

Title:

Include the title of the experiment at the beginning of the report.

Objective:

The objective should clearly state what the key quantitative results are that you are seeking in the experiment, and the method by which you are finding these results.

Procedure:

You have included the procedure in your laboratory notebook; therefore, **there is no need to include the procedure here**. Simply reference your lab notebook and the page numbers where the procedure and table of reagents and reactants can be found. You will be turning in the carbon copies from your notebook also.

Data and Calculations:

Data should be listed in a table or tables. All data should be clearly labeled and should include the proper units of measurement. You may also be required to graph your results. The graph should be included in this section and all axes should be labeled with the proper units.

Also, since your lab reports must be typed, you will need to learn how to use superscript and subscript notation. For example, the chemical formula for magnesium phosphate is $\text{Mg}_3(\text{PO}_4)_2$ **not** $\text{Mg}_3(\text{PO}_4)_2$.

Calculations should be organized in a logical fashion and they should be clearly labeled. For each type of specific calculation you must show at least one sample calculation using your data. Make sure that appropriate units are also included in the calculations. Generally, the only types of calculations that you may be performing in organic chemistry lab will be those related to percent yields or recrystallizations.

Conclusion:

The conclusion for each laboratory experiment will differ depending on the experiment; however there are always three main features that should be in the conclusion. First, your results should be presented as well as the expected or known values. Often times, these known values can be found using the AIST website. Make certain to reference any comparable data obtained from this site. Second, you should include an explanation of any sources of errors that might explain why your results are different from the known or expected values. Finally, you should also include some discussion of the technique and theory that was used to perform the experiment and to explain the results. The conclusion is the most important part of the laboratory report!