

Chemistry 302L
Organic Chemistry Laboratory
Tues, Thurs / ST445 / 1 - 5p
<http://home.sandiego.edu/~khuong/chem302L>
Summer 2007

Dr. Kelli Khuong
office ST440
phone x7971
khuong@sandiego.edu

OFFICE HOURS MTWTh, 11a–12:15p; MW, 1–2p; also by appointment

TEXT AND TOOLS

1. *Organic Experiments*, 9th Ed. by Williamson *required* (see Dr. Khuong if you don't have a copy)
2. Laboratory notebook, carbonless copy *required* (ISBN 1-930882-74-2 or 1-930882-00-9).
3. Safety goggles *required* (may be purchased in ST374, \$10, cash only)
4. Lab coat *encouraged*

COURSE GOALS

Upon completion of this course students should:

1. read, interpret, and perform an organic experiment with little or no assistance
2. know what glassware to use in that experiment
3. understand the underlying chemical principals of the syntheses that are performed and the methods used to isolate, purify, and analyze the resulting products

POLICIES AND PROCEDURES

absences Attendance is mandatory. There will be no make-up labs, and experiments may not be performed early.

academic integrity If a student is found in violation of USD's Academic Integrity Policy, that student will receive a grade of "F" for this course. In a laboratory course, academic integrity violations include falsifying your data, copying from another student's notebook (whether this semester or any previous semester of the course), using another student's computer files, and aiding another student's dishonesty.

lab access No student may enter the lab unless accompanied by an instructor.

lockers On the first day of lab, each student checks into a glassware drawer and becomes responsible for the drawer contents from the day of check-in until locker check-out during week 15 of the semester. The drawers will be unlocked at the beginning of each lab meeting, and it is the student's responsibility to make sure his/her drawer is locked at the end of each lab. Students will have to pay for any items missing or broken at the time of locker check-out.

hazardous waste All hazardous waste must be placed in the appropriate waste bottle in the designated hood in each lab. To minimize everyone's contact with hazardous waste, it is required that all waste bottles be capped when not in use. The first person during each lab period to use the waste bottle should unscrew the cap, put in the waste funnel, and add the accumulated waste. Leave the funnel in place for the duration of the lab period. The last person to use the waste bottle should remove the waste funnel, place it on the watch glass to drain, and securely cap the waste bottle. When a waste bottle is filled to 75%, cap it and replace it with an empty waste bottle from the back of the hood.

safety This is important enough to require its own page!

disabilities A student must notify the instructor as soon as possible if he/she has any disabilities that require special accommodations. The instructor will gladly work with that student and Disability Services to make the necessary arrangements.

communication It is important that the instructor be able to contact you throughout the semester. It is assumed that you will check your USD email regularly and that this will be a suitable way to provide you with necessary information.

COURSE GRADES

The majority of the assigned grade will be based on student performance during each experiment and on the student's lab notebook. A tentative assignment of the course grade will be based on the following breakdown, although the instructor reserves the right to modify the scheme as necessary.

ASSIGNMENT	Notes	Each	Total
Lab notebook	title, purpose, balanced reactions, table of reagents results, discussion, and answered questions	10 pts 30-40 pts	70 pts 290 pts
Observation checks	These will be short, unannounced checks of the observation sections of the lab notebook. You will use your lab notebook to answer specific questions about the experiments that you have already performed.	5-10 pts	30-50 pts
Quizzes	There will be three quizzes at the beginning of lab on weeks 2B, 4B, and 6B. The quizzes will closed notebook and will cover the material on the most recent experiments and the experiment for that day.	40 pts	120 pts
In-lab evaluation	overall evaluation of the student's lab techniques/skills	40 pts	40 pts
Total	final grades will be assigned on a straight percentage scale (i.e. 90-100 = A); plus and minuses will be given		~550 pts

laboratory notebook Please refer to the attached handout on keeping a lab notebook. When student notebooks are collected after an experiment, a grade is assigned based on the quality, organization, and completeness of the work contained inside.

The following sections should be prepared each week **BEFORE** lab.

Title, Purpose, Balanced reaction(s), Table of reagents and products, and Procedure:

Each student must prepare his/her notebook with sufficient procedural details in order to perform the experiment. Textbooks and handouts are not allowed in the lab. It is highly recommended that students do not simply copy the procedure but think about what steps will be done and why. Also, students should consider what type of data will be collected during the experiment and prepare any tables that would be helpful.

Observations should be completed each week **DURING** lab.

Results and Discussion sections should be completed each week **DURING** or **AFTER** lab.

due dates The copies of your title, purpose, balanced reactions, and table of reagents are due at the beginning of the lab. The copies of your procedure and observations are due at the end of lab. The copies of the results and discussion are due at the beginning of the next lab meeting unless otherwise stated. Late lab reports will not be accepted.

in-lab evaluation Evaluation of each student's laboratory skills will depend on several factors: a) preparation, independence, and time management, b) quality of lab techniques, c) ability to adapt to unforeseen procedural changes, d) general neatness and safety consciousness in the lab. For those experiments where a product is isolated, a sample will be submitted for evaluation.

laboratory cleanliness Each student is responsible for leaving his/her lab space clean and tidy. At the end of each lab, students should put glassware back into the lockers, wipe off hood stations with a damp sponge, and make sure all items in "common use" boxes and areas are replaced. A student's "in-lab evaluation" points will be penalized for leaving a messy station.

CHEMISTRY 302L LABORATORY SCHEDULE

Week	Date	Lab Schedule		Quizzes
1A	6/26	Check-in Read Experiment	Handout Computations: Electrophilic Aromatic Substitution	
1B	6/28	Read Experiment	Ch 38 pp. 388-395, 398 1 & 5 / Grignard Synthesis of Benzoic Acid (A)	
2A	7/3	Read Experiments	Ch 40 pp. 407-412 1 / Methyl Benzoate by Fischer Esterification (B)	
2B	7/5	Read Experiment	Ch 28 pp. 309-312 Nitration of Methyl Benzoate (C)	quiz
3A	7/10	Read Experiments	Ch 28 pp. 309-312 Analysis by GC/MS, IR, and NMR (D)	
3B	7/12	Read Experiment	Handout Kinetic v. Thermodynamic Control Morpholine with t-butyl acetoacetate (A)	
4A	7/17	Read Experiment	Handout Kinetic v. Thermodynamic Control Morpholine with t-butyl acetoacetate (B)	
4B	7/19	Read Experiment	Handout Suzuki Coupling (A)	quiz
5A	7/24	Read Experiment	Handout Suzuki Coupling (B)	
5C	7/26	Read Experiment	Handout Synthesis of Lidocaine (A)	
6A	7/31	Read Experiment	Handout Synthesis of Lidocaine (B)	
6B	8/2	Read Experiment Check-out	Handout Synthesis of Lidocaine (C)	quiz

THE LABORATORY NOTEBOOK / Chem 302L / Su07 / KHUONG

A record of all experiments you perform in the laboratory will be kept in a notebook that is bound and has page numbers. This laboratory notebook is as important as the actual experiments you perform and constitutes a permanent record of your experimentation. Therefore, all entries are to be made in ink, and mistakes are to be crossed out with a single line (no white out, no erasures). An experiment should always be started on a new page of the notebook. If you have to start another experiment before finishing the previous one, leave 2 or 3 extra pages at the end of the experiment, so that all of the work for a given experiment will be on consecutive pages. All work should be done in the notebook and not on separate sheets of loose paper. For example, additional questions or mechanisms that you are asked to address in the discussion should still be included in the notebook after the results section. Use professional language throughout the notebook; avoid first and second person pronouns like I, my, you, etc. Each experiment should have the following format:

I. Title

II. Purpose: A brief yet complete summary of the specific goals of the lab. In the context of these goals, briefly mention which basic techniques are to be used and the role that those techniques serve (for example, "isolated by extraction, purified by distillation, and analyzed by GC"). It takes practice to write a good purpose statement. You may want to leave a blank space and write the purpose after you completed sections III-V, to ensure that you really understand why a particular experiment is being done.

III. Balanced reaction(s): Use line structures or Lewis structures, not abbreviations; do not include mechanisms; do include possible side reactions; where necessary.

IV. Table of reagents and products: List all chemicals (name and structure) to be encountered in this experiment – all reactants, reagents, solvents, and products. Include molecular weights and relevant physical properties (e.g. mp, bp, density, solubility, concentration) for all entries. Note: An incredibly useful website for finding data for various compounds is chemfinder.com. You are encouraged to register and use it!

compound name and structure	MW	other properties

V. Procedure: Start writing the procedure on a new page of the notebook. The stepwise listing of operations is to be written using the left column of a page. In general it is a good idea to leave some space between steps (to allow ample room for accompanying observations), to sketch pictures of an apparatus the first time it is used, and to write instructions in your own words, grouping various operations according to how you would actually perform them in lab.

Procedure	Data and Observations
1. To 1-butyl alcohol (15.42 g, 0.208 moles) in a 50 mL round bottom flask was added in 3 portions 15 mL chilled concentrated H ₂ SO ₄ ...	When the sulfuric acid was added, the mixture remained clear and colorless.
2.	

VI. Observations: Use the right column to record raw data and accompanying observations for each step of the procedure. You should include enough detail so that another person could use your notebook to perform a lab and he/she would not encounter any unexpected results. It is most important that data and observations be recorded directly in the notebook immediately at the time of measurement.

VII. Results: Start writing results on a new page. Return to using the full width of the notebook (only procedure and observations are written in two column format). All calculations go in this section, including calculation of percent recovery, or theoretical and percent yield. Show all work for your calculations. This section should always include a boxed final table that summarizes all of the pertinent results of the experiment, e.g. unknown identification, composition of mixtures, yields, etc.

VIII. Discussion: First answer the question: "Did you accomplish the goal of the experiment?" then briefly support your answer to that question with experimental results. The remainder of the discussion is a succinct analysis of the meaning of your results and will often be guided by questions/statements provided by the instructor. When possible, compare results to literature values. Answer any additional assigned questions in this section.