

Chemistry 301L  
Organic Chemistry Laboratory  
Section 2 / Mbn / ST447 / 1: 25- 5: 25p  
http://home.sandiego.edu/~khuong/chem301L  
Fall 2007

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**OFFICE HOURS** M 9:30a – 10:30a; T 10a – 12p; W 10a – 11a; Th 2:30p – 3:30p; and by appointment

### TEXT AND TOOLS

1. *Organic Experiments*, 9<sup>th</sup> Ed. by Williamson *required*
2. Laboratory notebook, carbonless copy *required* (ISBN 1-930882-74-2 or 1-930882-00-9). This is the same kind that was required for general chemistry lab.
3. Safety goggles *required* (may be purchased from the Chemistry Club)
4. Lab coat *encouraged*

### COURSE GOALS

Upon completion of this course students should:

1. read, interpret, and perform a simple organic experiment with little or no assistance
2. understand the underlying chemical principals of each step in a given procedure
3. interpret collected data to reach conclusions about the outcome of an experiment

### 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 at the end 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.

**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.

**safety** Students are responsible for the general safety guidelines discussed in the USD Chemistry and Biochemistry Department safety sheet. Students are also responsible for finding relevant safety information about chemicals to be handled in the weekly experiments (discussed on last page of syllabus).

## COURSE GRADES

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
<b>Lab notebook</b>	<p>title, purpose, balanced reactions, table of reagents results, discussion, and answered questions</p> <p>See the last page of the syllabus for detailed information about formatting the lab notebook.</p> <p><b>due dates</b> The copies of your title, purpose, balanced reactions, and table of reagents are due at the beginning of lab. The copies of your procedure and observations are due at the end of a given experiment; however, <u>you must prepare your notebook prior to lab with sufficient procedural details in order to perform the experiment. Textbooks and handouts are not allowed in the lab.</u> The due dates for the results and discussion will be announced in lab. Late reports will not be accepted.</p>	<p>10 pts 25-40 pts</p>	<p>100 pts 270 pts</p>
<b>Observation checks</b>	<p>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.</p>	5-10 pts	30-50 pts
<b>Quizzes</b>	<p>There will be four quizzes at the beginning of lab on weeks 4, 7, 10, 14. The quizzes may be open or closed notebook and will cover the material on the most recent experiments and the experiment for that day. The final quiz will be cumulative.</p>	30 pts	120 pts
<b>In-lab evaluation</b>	<p>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.</p> <p>You are responsible for leaving your lab space clean and tidy. At the end of each lab, you 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.</p>	40 pts	40 pts
<b>Total</b>	<p>final grades will be assigned on a straight percentage scale (i.e. 90-100 = A); plus and minuses will be given</p>		<b>~560 pts</b>

**CHEM STRY 301L LABORATORY SCHEDULE**

<b>Week</b>	<b>Date</b>	<b>Lab Schedule</b>	<b>Quizzes</b>
<b>1</b>	9/10	<b>Check-in</b> Read course syllabus, Ch 1 & 2 Experiment Spartan module on polarity	
<b>2</b>	9/17	Read Ch 9, Thin layer chromatography, pp 123-127 Experiments 1; pp 127-135 Additional Perform TLC using <i>colored</i> compounds ferrocene and acetyl ferrocene (refer to pp 141-142 for structures)	
<b>3</b>	9/24	Read Ch 5, Distillation pp 65-70, Ch 11, GC pp 148-150 Experiments 2a, 3a; pp 71-74	
<b>4</b>	10/1	Read Ch 8, Extractions pp 103-114 Experiments 1; pp 114-115 Save crude products for recrystallization next week.	quiz
<b>5</b>	10/8	Read Ch 3, Crystallization pp 32-43, 47-48; Handout Experiments Recrystallization of naphthalene (handout) Continuation Ch 8, Exp 1: Recrystallize crude compounds from week 4. Allow recrystallized compounds to dry for mp analysis next week.	
<b>6</b>	10/15	Read Ch 4, Melting points pp 50-57 Experiment 4; p 55-56 Continuation Ch 8, Exp 1: Acquire mp's of crude and recrystallized samples from week 5.	
<b>7</b>	10/22	Read Solomons/Fryle Ch 5 Experiment Stereochemistry: Molecular modeling	quiz
<b>8</b>	10/29	Read Ch 3, 4, 8, 9 as reference; Handout Experiment Extraction to separate an unknown mixture	
<b>9</b>	11/5	Read Ch 3, 4, 8, 9 as reference; Handout Experiment Extraction to separate an unknown mixture	
<b>10</b>	11/12	Read Ch 17, Nucleophilic substitution pp 226-231 Experiments 1 and 2; pp 231-232 Modification Only select alkyl halides will be used.	quiz
<b>11</b>	11/19	<b>NO LAB</b> Thanksgiving Holiday	
<b>12</b>	11/26	Read Handout Experiment Hydration Reactions of Alkenes	
<b>13</b>	12/3	Read Handout Experiment Hydration Reactions of Alkenes	
<b>14</b>	12/10	Final meeting <b>Check-out</b>	quiz

## THE LABORATORY NOTEBOOK / Chem 301L / F07 / KHUONG

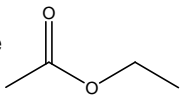
The laboratory notebook is as important as the actual experiments you perform and constitutes a permanent record of your experimentation. Therefore, all entries are to be made in ink, and mistakes are to be crossed out with a single line (no white out, no erasures). An experiment should always be started 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. Additional questions or mechanisms that you are asked to address in the discussion should still be included in the notebook. 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:** The title should be short and relevant to the actual experiment being performed.

**II. Purpose:** A brief yet complete summary of the 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 TLC and 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. Not all experiments will have this section.

**IV. Table of reagents and products:** List all chemicals (name and structure) to be encountered in this experiment – all reactants, reagents, solvents, products. Include molecular weights and relevant physical properties (e.g. mp for solids, bp and densities for liquids, solubility, concentration) for all entries. Include relevant safety information and first aid measures for select chemicals.

compound name and structure	MW	other properties	safety
ethyl acetate 	88.106	liquid bp 77.1 °C d 0.89 g/mL	flammable, eye/skin irritant; treat exposure by flushing with water, fresh air

Information needed for the table of reagents that is not included in the lab text is easily found online. Two websites you may want to become familiar with are [chemfinder.com](http://chemfinder.com) (unlimited free searching for chemical properties once you register for the site) and [fishersci.com](http://fishersci.com) (includes both chemical properties and MSDS)

**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 <sub>2</sub> SO <sub>4</sub> ...  2.	When the sulfuric acid was added, the mixture remained clear and colorless.

**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:** Briefly summarize the important results, then analyze/interpret the meaning of the results, being sure to address how the results relate back to the purpose/success of the experiment. Typical points to consider are purity of products (where appropriate), efficiency of the technique, interesting observation that merit interpretation, etc. When possible, compare results to literature values. The logic of your analysis is key because the ultimate goal is to convince the reader that the conclusions are sound. The discussion

will often be guided by questions/statements provided by the instructor. Answer any additional assigned questions in this section.