

FALL 2007 SYLLABUS

CHEM 343 ORGANIC II HONORS LABORATORY: TECHNIQUES AND INTRO TO SYNTHESIS & CHARACTERIZATION

Senior Instructor: Dr. Christine V. Rich
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Office Hours: Tues, 10 am or by appt.

Text: *The Organic Chem Lab Survival Manual*, any edition
Author: James W. Zubrick
Packets from Chem. Stockroom; LL38

The Teaching Assistants this semester are:

Section 01 Tuesday at 12:00: Alex Belshoff (acbels01@louisville.edu)
Section 05 Tuesday at 12:00: Rebecca Bottom (rbott02@louisville.edu)
Section 11 Friday at 12:00: Carol Patel (ckpate01@louisville.edu)
Section 12 Friday at 12:00: Wes Badger (wrbadg01@louisville.edu)

They will provide you with their office hours and other necessary information in the first lab session. Feel free to contact any one of them for help/questions. I'm confident they all know their organic chemistry. However, I would suggest that any grading questions be directed to your TA. If you have a complaint about the way your lab reports are graded, don't hassle the TA...come directly to me.

The tentative schedule of experiments is shown below. I may rearrange the ordering of the experiments if doing so better aligns the session with your lecture progress. **Don't forget to answer any questions posed in the packet in your final reports.

<u>Dates</u>	<u>Exercise/Experiment</u>	<u>Pre-Lab Reading</u>
Tues, Aug 21 Fri, Aug 24	check-in; lab safety; equipment demo: micro and macro; course protocol	take some time to read Zubrick Chaps 1,2,4-9..lots of useful stuff!
Tues, Aug 28 Fri, Aug 31 & Tues, Sept 4 & Fri, Sept 7	1) Purification & identification of unknown solids: Recrystallization and melting point determination. 2) Microscale boiling point determination	read Zubrick Chap 10-14 & Chap 25 (5 th) or 26 (6 th) in Zubrick
Tues, Sept 11 & Fri, Sept 14	Isolation of Essential Oils: Steam Distillation, Extraction of oils & IR analysis of products. Microscale. Setup for Ethanol Synthesis.	read Zubrick on steam distillation; Chap 15, 16, and 36 (5 th) or Chap 37 (6 th) Chap 33 (5 th) up to p242 and then p249- end OR Chap 34 (6 th) up to p282 and then 288-end.
Tues, Sept 18 & Fri, Sept 21	Distillation of Ethanol "Is there a potential bootlegger in our midst?" Macroscale "Green Chemistry" approach	read Zubrick Chaps 17-20 (applica- ble sections). Chap

		35 (5 th) or 36 (6 th)
Tues, Sept 25 Fri, Sept 28	Extraction of chlorophyll and carotenoids from fresh spinach: thin layer chromatography; (Save your crude products!). Microscale 2) Column chromatography separation of chlorophyll and carotenoids. Tlc monitoring of eluants. Microscale	review Chap 15-16 and 36(5 th) or 37(6 th) Chap 26-28 (5 th) or Chap 27-29 (6 th).
Tues, Oct 2 & Fri, Oct 5	Kinetics: Determining the Rate Law for a Nucleophilic Substitution Reaction. Macro-scale; partners	review your chem 202 on kinetics if necessary
Tues, Oct 9 & Fri, Oct 12	Fall break -enjoy! Go to the movies, read a novel, sleep!	
Tues, Oct 16 & Fri, Oct 19	Acid-catalyzed dehydration of an alcohol. Collecting gaseous products; GC analysis of product mixtures. Ultramicroscale	read Zubrick p 51-54 and Chap 31 (5 th) or 56-60 and Chap 31(6 th)
Tues, Oct 23 & Fri, Oct 26	Acid-catalyzed hydration of norbornene: a stereoselective alkene addition. Microscale	read Zubrick on separatory funnel extraction and sublimation
Tues, Oct 30 & Fri, Nov 2	The stereochemistry of Br ₂ addition to <i>trans</i> -cinnamic acid. Microscale	read Zubrick on refluxing
Tues, Nov 6 & Fri, Nov 9 and Tues, Nov 13 & Tues, Nov 16	Williamson ether synthesis: butyl ethyl ether 1) synthesis and work-up Miniscale	review Zubrick on reflux, extraction and Chap 34 on NMR
	early check out is an excellent possibility here*	
Wed, Nov 21-Fri, Nov 23	Thanksgiving Break- eat turkey...and all the leftovers	
Tues, Nov 29 & Fri, Dec 2	final check out if needed (and settle accounts, if necessary)	

Other information you will want to know:

Safety: Is still a #1 priority! Lab safety glasses and appropriate dress are mandatory. No shorts, tank-tops, sandals, etc. If you are forgetful, you are welcome to store sweat pants and tennis shoes in your lab drawer. Long hair must be tied back. Gloves are available and sometimes will be made mandatory. Be sure you pay attention when the TA or I point out the safety features in the lab. Pay particular attention when we discuss any safety tips for a given experiment. Precautions are noted at the end of each experiment's write up.

Course Objectives: The primary objective of this laboratory course is to give you hands-on experience with the basic techniques employed by organic chemists. As you begin to master these techniques, you will be asked to apply them appropriately in synthesis experiments. In the latter part of the semester, we'll also introduce you to some of the important characterization/product analysis techniques that will be emphasized in the second semester lab. My fantasy goal is to turn every one of you into accomplished, creative, problem-solving, organic

bench chemists. This means that I'll be emphasizing not only the "how to" but also the "why and when to" inherent in organic experimentation.

Notebooks: I'm flexible. Some students like to use the bound carbonless notebooks so that they have a permanent record (the yellow copy). Others prefer having 2 composition books so that while the TA or I grade one experiment, they can be using the other notebook to prepare for the next session. Handwritten reports should be done in ink (I'll allow pencil for calculations only). Most would rather use a computer to prepare reports and then hand in a hard-copy. Currently, this seems to be the most popular method because you can prepare sections ahead of time and jot down observations and data during lab on a 'trial copy'. After lab, you can fill in your data and observations neatly on a reprint. Your TA will not accept sheets torn out of a spiral notebook! The other formats are fine...just be sure your report is complete and turned in by the due date set by your TA. Late reports are docked 10 pts per day. The TA or I will discuss the format of the lab report with you in class. There is also a sample lab report at the end of the lab packet. **Lab reports are due during your scheduled lab time one week following completion of the experiment.**

Lab Preparation: All of the basic organic lab techniques and many other helpful hints for success in the lab are discussed in Zubrick's manual. The syllabus lists the basic techniques you'll employ to carry out the experiment. **BE SURE** to read the appropriate section describing these techniques in the lab manual so you'll be prepared when you come to lab. I have a variety of other, less light-hearted, lab texts available if you would like additional information about a technique. Don't be bashful about coming to my office and signing out these supplementary texts. The actual experimental procedures will be provided to you in the form of a packet that is available for a minimal fee (usually \$4).

When you come to lab, the experiment should be partially written up with information like the title, purpose, overall reaction, and general procedure. Naturally, you will add observations, data, and conclusions during the lab period.

There are usually no formal pre-lab questions included as part of your graded experiment. I assume that you guys will come prepared and won't need that kind of prodding. However, given that this semester you actually do one less experiment (and get out one week earlier), I have decided to include occasional pre-lab questions to be turned in at the start of the experiment. Sometimes, I pose questions within the lab handout. These should be answered and turned in as part of the lab report.

Grading: We'll work on the 10 pt scale (100-90 = A, 89-80 = B, etc). Notice on the syllabus that there are 7 single session experiments, each worth 100 points, and 2 double session experiments, each worth 200 points, for a total of 1100 points. You will be allowed to drop one lab grade worth 100 points (or one-half of a double session grade). This means grades will be computed based on a possible 1000 points. If you earn the following number of points, you are guaranteed the letter grade shown:

1000-900	90% - 100%	A
899-800	80%-89%	B
799-700	70%-79%	C
699-600	60%-69%	D
below 600 pts	below 60%	F

Yields are not the primary focus in this laboratory course. What is more important to me is that you demonstrate that you can work and think like a good bench chemist. The quality and thoroughness of your lab report will contribute strongly to your overall grade; your technique and lab habits as observed by the TA or me will also be a factor. *Please* don't fudge data in the hopes of getting a better grade! If you do have a low yield, a low mp, or impurities in your product, can you offer reasonable explanations? That's much more important since it shows you are thinking about "what should" vs. "what might" have happened during the experiment.

There are no make-up labs. If you must miss a lab session due to illness or some other unavoidable circumstance, consider that to be the lab you will be dropping. For unusual circumstances, come see me. Usually we can work out an arrangement agreeable to both of us. Athletes, please give me as much advance notice as possible of your travel schedules.

MISCELLANEOUS INFO: This semester we'll be doing more with microscale chemistry in non-honors sections also. Even though we don't have enough microscale kits and support equipment for each student's drawer, the equipment is compact enough to work with on a daily "check-out" basis. Please take good care of this stuff and be considerate about cleaning it after use...others need to use it too. Also, please be careful to return all microscale equipment at the end of the session so other sections can be assured of having an adequate supply. I think the extra effort here is worthwhile. Not only is our microscale effort an environmentally sound approach to bench chemistry (reduced reaction scale = less chemical usage = less chemical waste generated = less student exposure to toxic and explosive chemicals = safer lab conditions), I think you will also find that microscale experiments enjoy another benefit shorter reaction times!

Problems? Both the TAs and I have office hours. Often, you can just drop by and catch me in my office.