

Organic Chemistry Laboratory

Chemistry 333

Recitation: 1:30-2:20 PM TTh; Laboratory: 2:30-5:20 PM TTh; MG 1036

Instructor: Dr. Peter Ramberg, 3082 Magruder, x4620, ramberg@truman.edu

Office Hours: M 10-12, W 1:30-3:30, by chance, or by appointment

Text: Pavia, *et. al.*, *Techniques in the Organic Laboratory*, Harcourt, 2002, Individual experiment handouts online.

Welcome to the introductory organic chemistry laboratory! This course is has three related objectives: 1) to introduce you to some of the most basic procedures and techniques used by organic chemists for making, separating, purifying, and identifying compounds; 2) to learn how to maintain an accurate laboratory notebook, a skill necessary for any practicing chemist; and 3) to relate your knowledge of chemistry from your lecture class to practical ability and “real world” experience in chemistry.

General Information and Policies:

1. You will need a bound notebook with carbon copies to record your activity in lab. These are available at the bookstore. In this notebook you will record all of your data, calculations, and observations in permanent ink. The idea of the notebook is that someone with some knowledge of organic chemistry should be able to use the notebook alone to recreate your experiment.
2. The laboratory text and handouts will not be allowed in the laboratory. Be sure you have read and are familiar with the experiment and all possible hazards associated with it, and you have written the procedure down in outline form in your notebook before coming to class.
3. Each experiment requires a written laboratory report due shortly after its completion. These reports will be recorded directly in your notebook, and you will turn in the carbon copies. They will consist of your lab preparation notes and activity in the lab, your data analysis and calculations (usually one or two pages), and your conclusions or answers to any questions. Late reports will lose ten percent of the possible grade. For more information, see the page on lab reports.
4. All handouts for the class are available in PDF at the following URL:

<http://www2.truman.edu/~ramberg/teaching/chem333/chem333.html>

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5. Grades will be assigned on the basis of the quality of your prelab exercises, lab reports, a final exam, and on a subjective evaluation of your performance (including improvement).

There are 900 total points for the semester, divided as follows (this may be subject to slight revision as the semester proceeds):

a) Prelabs (14)	70 points (5 each)
b) Lab reports (14)	50 points each (700 total)
c) Lab report (qualitative analysis)	225 points (75 each unknown)
d) Products (8)	80 points
d) Midterm and final	200 points (2x 100)
e) Notebook check	170 points (10 each exp., 30 pts qual)
e) Subjective Evaluation	200 points
Total:	1645 points

Rules and Regulations for the Laboratory

Time: The lab meets from 1:30-5:30 on Tuesdays and Thursdays. Some days we will have a recitation at 1:30, on others you will have the whole time to work. The lab is not a race or competition. Work at a steady pace--efficiently, carefully, and most important, thoughtfully. Before beginning the experiment, you should understand both the practice and the theory behind the operations. Accurate, knowledgeable, and methodical work will be rewarded in your evaluation grade and in shortening the amount of time you must spend in the lab. If you have questions, please ask, but you should try to answer your questions yourself. If your work is of sufficient quality, your thoughtfulness and preparedness will more than make up for a slightly incomplete lab. A poor result with a good explanation will always receive a better grade than a good result with a poor or no explanation.

Cleanliness: Continually monitor the cleanliness of your work area. Merely wiping with a dry paper towel is not sufficient, and you should use a damp sponge. Leaving an unclean work area will significantly lower your lab evaluation.

Keep the area reserved for reagents neat. Clean up drips and spills immediately. Drippy, slimy, disgusting reagent bottles will not be tolerated. If you spill a solid chemical, sweep it up at once. Use a broom and dustpan, and ask where to put it (don't just throw it in the trash). Never leave reagent bottles open, and especially, never leave a metal scoop stuck into a bottle of reagent--metals are reactive towards many reagents.

The area around the balances tends to become particularly messy. For the sake of the balances and of general tidiness, please keep them clean. Clean up spilled *reagents, liquid or solid, from around the balances immediately; you will lose points for failing to do so.* Any or all of you can be conscripted in the laboratory for specific clean-up tasks.

Safety: Organic labs are potentially dangerous for a number of reasons, please regard the following. If you do not follow these recommendations, you will be asked to leave the laboratory for the day and will receive an F for that experiment.

- 1) Accidents are usually related to the frequency of inappropriate behavior. Walk, don't run, through the laboratory. Don't carry open vessels of reagents. Reseal all reagent bottles after use. Clean up spills immediately. Pay due respect to neighbor students, their work, and their space. Most of all, keep calm; do not rush, do not cut corners. I will expel students from the laboratory (and possibly the class) if their behavior causes dangerous or unprofessional conditions.
- 2) Fire - At no time are open fires permitted. If a flame is required (e.g. for the drawing of capillaries) it will be set up in a communal hood.
- 3) Hazardous substances - I will inform you of any potential hazards associated with materials in a particular experiment, and you should ascertain any possible hazards as part of your preparation for each experiment. Follow the advice carefully. Careless handling of

hazardous materials *will count against your evaluation*. Remember also that your own carelessness can result in serious and painful bodily injury, which should be punishment (and warning) enough in itself.

4) Dress code - Contact lenses are strongly discouraged! Organic solvents can irritate your eyes, or worse, if you wear contacts. Do not wear open-toed shoes or sandals (no exceptions). You should also always wear long pants, but if you absolutely insist on wearing shorts, you must wear a lab apron. Securely fasten long hair behind your head.

5) Goggles must be worn at all times in the laboratory, and are available from the bookstore or from AXΣ. If you do not arrive with goggles, you will be asked to leave the lab until you return with goggles.

6) Unauthorized experimentation is not allowed, but if you would like to perform an auxiliary experiment either to elucidate a question relating to the lab or to satisfy your curiosity, you are *encouraged* to do so, if time permits, and after receiving permission.

6) No eating, drinking, or smoking is permitted in the laboratory.

7) You may not play radios, tape players, etc. in the laboratory. The lab should be free of distractions to concentrate on the work at hand.

Finally, don't be overly afraid of working with chemicals in the laboratory. Some are not hazardous, others are more so. If you are concerned about the safety hazards of particular chemicals, look up the potential hazards in the library. The best attitude is to treat all chemicals as if they are hazardous, but not be terrified of coming in contact with them.

Academic Integrity: You are expected to do your own work in this course. Although I enthusiastically encourage cooperation and discussion, when all is said and done, you must be able to do all your own work in the laboratory and on paper, and your grade will be independent of your fellow students. Any form of academic dishonesty, including the inappropriate use of your fellow students' or published work, or in the execution of experiments in the laboratory will be treated seriously, with penalties ranging from an F in the experiment to failing the class. Your lab reports will be graded solely on the basis of how well you explicate the purpose of the experiment and explain your results, not in comparison to how the class did as a whole on the reports. Similarly, your lab evaluation is based on your own attitude and preparedness in the lab.

Tentative Schedule of Experiments

Date	Experiment	Reading
Aug 30	No lab	
Sept. 1	Orientation, Safety Discussion, and Check In	
Sept. 6	Crystallization (MAC and mic, 2P)	
Sept. 8	Thermometer calibration, melting point determination	
Sept 13	Friedel-Crafts Alkylation (P, NMR)	
Sept. 15	Fractional Distillation (MAC)	
Sept. 20	Extraction (MAC)	
Sept. 22	Extraction II (3P)	
Sept. 27	Extraction of Fat from Junk Food	
Sept. 29	Steam Distillation (mic, IR)	
Oct. 4	Sodium Borohydride Reduction of 9-Fluorenone, with TLC	
Oct. 6	Optical Activity/Polarimetry, Receive Qualitative Analysis Unknowns (for IR and NMR)	
Oct. 11	Make up day	
Oct. 13	Midterm Exam	
Oct. 18	Multi-Step Synthesis Part 1	
Oct. 20	Grignard synthesis of triphenylmethanol II (MAC)	
Oct. 25	Grignard synthesis II(P)	
Oct. 27	Alcohol Dehydration (GC)	
Nov. 1	Multi-Step Synthesis II	
Nov. 3	Qualitative Analysis I	
Nov. 8	Qualitative Analysis II	
Nov. 10	Qualitative Analysis III	
Nov. 15	Multi-Step Synthesis III	
Nov. 17	Qualitative Analysis IV	
Nov. 22	Thanksgiving week, no lab	
Nov. 29	Synthesis of Luminol	
Dec. 1	Chemiluminescence of Luminol AND Aldol Condensation to form Tetraphenylcyclopentadienone	
Dec. 6	Makeup day and/or checkout if time permits	
Dec. 8	Final Exam (during recitation time) and Checkout	

