

CHEM 213
Organic Chemistry Laboratory
Spring 2014

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Lab Hours	TR 8:00 - 10:45A TR 2:30 - 5:15 PM	MW 2:30P - 5:15 PM
Office Hours	M 3:00 - 4:30 PM W 10:00 - 11:00 AM R 1:00 - 2:00 PM & by appt.	MF 11:15 AM -12:05 PM, W 9:05 - 9:55 PM & by appt.
Webpage	ANGEL	chemistry.bd.psu.edu/halmi

Course Description:

A strong foundation in organic laboratory skills is provided in this course. Laboratory work includes learning the basic techniques including recrystallization, melting point determination, distillation, liquid/liquid extraction, thin-layer and column chromatography. Mastery of these basic techniques lays the foundation for carrying out a number of organic syntheses or natural product isolations. Students will have access to modern instrumentation for the characterization of synthetic products or organic unknowns. Standard analysis methods include IR, NMR, UV/Vis spectroscopy, mass spectrometry, polarimetry and GC. CHEM 210 is a prerequisite and CHEM 212 a co-requisite for this course.

Required Instructional Materials:

- Lab Text:** Multiscale Operational Organic Chemistry:
A Problem Solving Approach to the Laboratory (2nd Edition.)
John W. Lehman, Prentice Hall; ISBN:978-0-13-241375-6.
- Lab Notebook:** Bound carbonless carbon copy notebook (100 pages)
- Goggles:** Goggles or safety glasses with side-shields are acceptable. Protective clothing is strongly recommended.
- Combination Lock:** Bring your own or purchase from the chemistry club during lab.

Grading & Course Policies:

Point distribution:

Lab Reports	575 pts
Lab Courtesy:	25 pts
Total	600 pts

Final Grade Scale:

A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	75-79%
C	70-74%
D	60-69%
F	< 60%

Late Reports:

A 5-point per day deduction is assessed on all late reports.

Lab Courtesy:

Failure to abide by safety rules will result in automatic deduction of courtesy points. Point deduction can also result from being chronically late, leaving early, disrupting or distracting other students. Courtesy points will also, to some degree, be a judge of your preparedness for lab (i.e. do you know what you are doing when you come to lab) and how you use your time in lab (i.e. do you work efficiently).

Check-Out:

Failure to check-out of a CHEM 213 laboratory drawer will be penalized with 50 point deduction and a \$25 check-out lab fee. You will also be responsible for the cost of any broken or missing items. This fee will be access on your student account even if you drop or withdraw from the course.

Attendance:

It is very important that you attend lab. A grade of **W** is awarded to students who withdraw prior to the Late Drop Period (**April 11th**). Students are advised to discuss attendance irregularities or poor class performance with the instructors. Do not simply stop your attendance. This may result in an **F** for the course.

Academic Dishonesty:

Succeeding in CHEM 213 is dependent upon students learning from the textbook, the instructor, but also from each other. Working individually, with a partner or in groups may be required throughout the semester. Working in groups and helping each other is strongly encouraged; however, we strongly believe that students understand the fine line between collaborating and plagiarism. Please do not cheat. This means students should not share data and/or final reports. Penn State Erie puts a very high value on academic integrity, and violations are not tolerated. Academic integrity is one of Penn Stare's four principles to which all students must abide. Any violation of academic integrity will receive academic and possible disciplinary sanctions, including the possible awarding of an XF grade that is recorded on the transcript and states that failure of the course was due to an act of academic dishonesty. All acts of academic dishonest are recorded so repeat offenders can be sanctioned accordingly. For more information see the Academic Integrity & Academic Dishonesty (Senate Policy 49-20) at <http://www.psu.edu/ufs/policies/> or Behrend's Academic Integrity policy at psbehrend.psu.edu/intranet/faculty-resources/academic-integrity.

Learning Resource Center:

The Learning Resource Center promotes the academic success of Penn State Erie students through peer tutoring and study skills advising. Tutoring is free and available in most subject areas. Information can be found at psbehrend.psu.edu/Academics/academic-services/lrc.

Note to students with disabilities:

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for modifications or reasonable accommodations in this course, please contact the Disability Specialist in Room 1 Reed Union Building, 898-7101. Information can be found at www.behrend.psu.edu/student/Educational%20Equities/DISABILITY.htm.

Tentative CHEM 213 Schedule

Week of	Monday/Tuesday	Wednesday/Thursday		
	Experiment	Experiment	Report Due (pts)	Exercises
January 13	Check-in/Safety	Exp 2/3	-	-
January 20	NO LAB	Exp 2/3 (continued)	-	-
January 27	Exp 4	Exp 4 (continued)	Exp 2/3 (25 pts)	Exp 2 (1, 2) Exp 3 (1, 2, 3)
February 3	Exp 15	Exp 9	Exp 4 (25 pts)	1, 2, 5
February 10	Exp 32	Exp 32 (continued)	Exp 15 (25 pts)	1, 3, 6
February 17	Exp 23	Exp 23 (continued)	Exp 9 (25 pts)	3, 5, 6
February 24	Exp 35	Exp 35 (continued)	Exp 32 (50 pts)	3, 5, 8
March 3	Exp 22	Exp 22 (continued)	Exp 23 (50 pts)	2, 3, 5
March 10	Spring Break			
March 17	NO LAB	Exp 30	Exp 35 (50 pts)	2, 3, 6
March 24	Exp 30 (continued)	Exp 42	Exp 22 (50 pts)	1, 4, 6
March 31	Exp 42 (continued)	Exp 37	Exp 30 (50 pts)	2, 3, 6
April 7	Exp 37 (continued)	Exp 5	Exp 42 (50 pts)	2, 3, 6
April 14	Exp 5 (continued)	Exp 56	Exp 37 (50 pts)	2, 3, 7
April 21	Exp 56 (continued)	Exp 56 (continued)	Exp 5 (50 pts)	2, 4, 5
April 28	Exp 56 (continued)	Check-Out	Exp 56 (75 pts)	3, 6, 8

Experiments

Pre-Lab Assignments

- Prepare a written pre-lab assignment in your lab notebook according to the instructions in the text, page 912. An experimental outline is sufficient; the list of equipment and a flow chart may be included but are not required. Please use the text and the report guidelines to prepare your prelab.
- Perform all “Before You Begin” exercises for that experiment.
- Read all the “Operations” sections in text associated with experiment (i.e. OP-10 Mixing).
- Assume all experiments are performed “Standard Scale” unless otherwise indicated.
- You must be aware of what you need to do to start an experiment *before* you arrive in lab. If indicated in the “before you begin” section, calculate the amount of chemicals you are required to measure out and become familiar with the type of glassware you will be asked to use. A helpful guide to identifying laboratory glassware is in the textbook (pg. 908-911).
- If the pre-lab is missing or incomplete you will **not** be permitted to start the experiment.

During the Experiment

- Remember a laboratory notebook is just that, a notebook. You wouldn't take detailed lecture notes after leaving the lecture hall, do not do so in lab. It is a ‘habit’ that you need to form. You need to tell yourself consistently through the first few experiments to take notes after every step is accomplished. Do not write data on backs of handouts, post-it notes or any other secondary means ~ all original data goes directly into the notebook!
- Do not use personal pronouns such as “I”, “my”, etc.
- All calculations must be in the notebook! The textbook has a detailed reminder (from general chemistry) on how to do the stoichiometry calculations required for most organic experiments (Appendix IV, pg. 918-922).
- Honesty is required in the notebooks and data keeping. We are preparing you for a career as a professional in the sciences. This is one reason why notes must be directly written in a notebook and all errors crossed out with a single line. In academia or in industry laboratory notebooks are legal documents and are often audited for accuracy and completeness. For safety reasons they are used to trace where accidents occurred and what the individual was doing at the time of the incident. This information can be vital in assisting the individual (if they are not conscious) and in preventing a repeat of the accident.
- Neatness is required in the notebooks. As stated above the notebooks purpose is to communicate what you have done, more often than not, to someone else. Points will be deducted from your notebooks if they are not organized and legible. Writing in the margins or not leaving “white” space for instructor comments is highly discouraged.
- Safety is required in the lab. Failure to follow safety rules will result in point deductions or expulsion from the lab.
- Cleanliness is required in the laboratory. Respect for the shared common areas (mp/IR) is expected.
- You are responsible for keeping glassware clean and drawer free of loose solids and liquid stains.
- Your hood location must be clean and wiped down after every experiment. All hoses, bowls, and clamps must be put back in their storage areas when you finish your experiment. Hotplates may be left out at the instructors’ discretion if they still need to cool down. The thick vacuum hose on the aspirator may be left in place.
- All waste must be disposed of per the instructions from your instructor. Do not let old products and unknowns collect in your drawer! Please do not leave behind waste of any type for future classes.
- You will be assigned cleaning duties in the lab. Failure to keep the lab as you found it will result in point deductions.

After the Experiment

- Complete the Calculations, Raw Data, Results/Discussion, Conclusions, References and Exercises sections of the “Writing A Laboratory Report” in your notebook (Appendix III, pg. 913-914, #4-8). Only complete the assigned exercises.
- Tear out the perforated pages of your notebook for turn-in on the specified due date. Late reports will receive a 5-point deduction per day late.
- Any raw data (IR spectra, GC chromatograms, etc.) should be attached at the end.

Tips for Keeping a Good Notebook

1. Leave two pages at the front of your notebook for a title page and a table of contents.
2. The first entry in your notebook for each particular experiment must be a PreLab.
3. Include the date each time you continue the same experiment on a different day.
4. Always write in blue or black permanent ink.
5. It is helpful to have an appendix on the back pages of your notebook with common information. This may include boiling points, melting points, molecular weights, abbreviations, etc.
6. Always record weights, measurements, colors, smells, unusual events, spills, and any other observations.

For example:

- added 0.263 g of NaCl to 20 mL of distilled H₂O
 - beaker became very warm and the water began to boil
 - smoke appeared to come from the beaker
 - after containing the smoking beaker in the hood, the NaCl container was examined
 - the container was not NaCl, it was Na (sodium metal)
 - disposed of hazardous Na/H₂O with a slow addition isopropyl alcohol
 - started experiment again
8. Use as many standard abbreviations and chemical formulas as possible. It will help you practice for lecture and save you time in the lab.
 9. Record your data as it occurs. If you wait until the end of the class period you will not remember that actual steps you took. Very often it will deviate from the text, so the text is no longer a reliable source. You will need this detailed information for the procedure section of your final report. You do not have to write in complete sentences in your notebook.
 10. At the end of the class period, it is essential that you have me sign-off on your data. This ensures academic honesty, but more importantly it helps me give time to provide each student information for the next class period.

Reports Guidelines

Prelab

- Title Page:** Include your name, section number, date and title of the experiment (brief).
- Introduction:** Include goal(s) and/or objective(s) of experiment, name/type of reaction(s), pertinent background information, experimental outline, chemical reaction(s) and any “before you begin” exercises.
- Physical Data:** Relevant physical data (chemical structure, melting/boiling point, density, hazards and/or concerns associated with each laboratory should be listed in a table format. Page 57 your text provides a good model to follow.

Inlab Observations

- Procedure:** The procedure is a detailed account of everything you accomplished during the lab. This portion of the report does not need to be in complete sentences but must contain enough information that a classmate could repeat your procedure exactly.

Final Report

- Raw Data:** All raw data should be included in this section, i.e. mp, weights, spectra, etc. The information should be in a summary table or graph when appropriate. Include simple analysis, e.g. IR table with peak assignments or other relevant spectra analysis

- Calculations:** Any calculations (detailed % yield, corrections, etc.) must be detailed here.

- Results/Discussion:** The results/discussion section of your synthesis labs may include all or some of the following:

(1) Discussion of the chemistry

- discuss what type of reaction you are doing/purpose of the experiment
- include chemical equations for your reaction to show the transformation
- discuss any potential stereoselectivity or regioselectivity in the reaction (if there is potential to form more than one product, why is this one formed?)
- discuss any side reactions that occur or side products that could form
- include a mechanism, where applicable

(2) Discussion of results

- address the identity of your products based on spectral data (this should include and analysis of IR, NMR, etc as well as comparing your spectra to that of the any known compounds, SDSB/NIST websites are helpful)
- address the purity of your products based on melting point and/or spectral data (include literature values were applicable)
- address the percent yield of your product(s) & briefly discuss any problems

Final Report (continued)

Conclusion: Statement with final conclusion; state your final results. (brief)

References: Include source(s); text, handout, and/or reference books, spectra catalogs, etc.

Exercises: As assigned on tentative schedule.

Other criteria for Final Reports

1. All reports must be completed in the carbonless duplicate notebook. The original will be turned in.
2. Use passive voice and past tense. Do not use the first or second person singular or plural.
3. The report should be concise.
4. Do not muddle procedure, results, calculations and discussion together. Each section should be complete before you start the next.
5. The data should dominate the report, being clearly tabulated for maximum visibility.
6. Literature values for physical constants should be reported and correctly referenced.
7. Do not write a detailed account of standard procedures, m.p. needs no further explanation.
8. Do not dispose of your products until your report is returned and graded.
9. An equation for every **reaction** that occurred during the experiment should be included.
10. All raw spectra and chromatograms should be included as a figure or appendix to your report with the operating conditions.
11. Peak assignments should be written **directly** on the spectrum. These assignments must also be tabulated in the results section.