

**Chemistry 235 Syllabus**  
**Organic Chemistry I Laboratory**  
**Spring 2018**

**REQUIRED LAB MATERIALS:** Laboratory Experiments for Organic Chemistry – Available to download, goggles, apron, and a laboratory notebook.

**COREQUISITE:** Chemistry 233

**GENERAL INSTRUCTIONS:**

- Experimental Procedure: A pdf file for each experiment can be accessed and downloaded via the link below. **You are responsible for printing out and bringing the experimental procedure to lab with you each week.**  
<http://community.wvu.edu/~josbour1/pages/Chem235.html>
- Safety and Laboratory Rules: Before any laboratory work is permitted, you must read the WVU "Safety and Laboratory Rules for Organic Chemistry" and then sign a statement that you will abide by these rules.
- Clothing: NOTE: SAFETY GOGGLES AND LABORATORY APRONS ARE REQUIRED FOR ORGANIC CHEMISTRY LABORATORIES. They can be purchased at the University Bookstore. Proper lab attire is the equivalent of a T-Shirt, Pants that cover from the waist to the ankles, and shoes that cover the entire foot. Tank tops, muscle shirts, spaghetti strap tops, tube tops, backless shirts, calf length yoga pants are all on the UNACCEPTABLE list. Slip on shoes that cover the tops of their feet but leave the heel area exposed are also UNACCEPTABLE.
- Notebook: Use a spiral bound carbonless copy duplicate page notebook for recording you laboratory observations and results. You must bring this notebook to each laboratory session. The notebook can be purchased from the WVU bookstore.
- Attendance: If you are forced to miss a laboratory period due to illness or an emergency, contact your instructor and teaching assistant. There are no makeup labs for Chemistry 235.
- Quiz: A quiz will be given each week at the beginning of the laboratory period, so be on time! Study the experiments before you come to the laboratory! You are expected to understand the principles of the experiment and to know what you are going to do before coming to the laboratory.
- Final Exam: The final exam will cover material from the first lab to the last lab. Study your old quizzes and the pre- and post-lab questions to help prepare for the lab final. There is no makeup lab final exam and missing the final exam counts as a grade of zero.
- Your Teaching Assistant is in charge of your laboratory section. Follow instructions made by your TA concerning lab safety, keeping the lab clean, procedures, handing in assignments, etc. Do not be hesitant about asking your TA questions-- he/she is there to help you. Failure to heed the instructions of your TA will result in a lower TA subjective grade.

**Fill in your TAs contact information incase you need to get in touch with him or her.**

Lab TA: \_\_\_\_\_

Email: \_\_\_\_\_

Mailbox: Clark 217

## Schedule of Experiments Spring 2018

Week	Week Of:	Experiment	Subject
1	Jan 8		No Lab
2	Jan 15		Check-In Laboratory Safety Discussion Laboratory Notebook Discussion
3	Jan 22	1	Melting Points
4	Jan 29	2	Crystallization
5	Feb 5	3	Distillation
6	Feb 12	4 5	Gas Chromatography* Thin Layer Chromatography
7	Feb 19	6	Extraction
8	Feb 26	7	Stereochemistry*
9	March 5	8	Infrared Spectroscopy*
-	March 12		Spring Break – No Lab
10	March 19	9	Hydroboration-Oxidation of Alkenes
11	March 26	10	Two Step Synthesis of Diphenylacetylene
12	April 2	11	Substitution Reactions - 1
13	April 9	12	Substitution Reactions - 2
14	April 16	13	NMR Spectroscopy*
15	April 23		Lab Final Exam, TA Evaluations, and Checkout

For experiments indicated with an asterisk (\*), you do not have to complete a notebook write up. Rather, you should complete the report sheet posted on the lab website.

Grade Calculation	
Notebook and Experimental Results	50%
Quizzes	20%
Lab Final	20%
TA Subjective Grade (neatness, attitude, etc.)	10%

Your TA is the authority when it comes to the due dates for experimental write-ups in your lab notebook. Lab work that is turned in late will be subject to a 10% (1-7 days late) or 25% (more than 7 days late) penalty.

**Academic Integrity:** *The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at the Student Conduct Code at [http://studentlife.wvu.edu/office\\_of\\_student\\_conduct](http://studentlife.wvu.edu/office_of_student_conduct).*

**Inclusivity Statement:** *"The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see <http://diversity.wvu.edu>."*

### **Expected Learning Outcomes**

The organic chemistry laboratory course is designed to enhance the understanding of organic chemistry through experimentation. The skills acquired in the first semester organic chemistry laboratory course will provide a fundamental background for continuation into more advanced synthetic chemistry laboratory courses and eventual careers involving a laboratory science.

Upon successful completion of the Chemistry 235 laboratory course, students are expected to have the following proficiencies:

- **Effective Scientific Communication Skills** – Students in the Chem 235 laboratory are expected to maintain an accurate laboratory notebook documenting exactly what was done in the laboratory and when it was completed. Students should be able to competently explain and discuss organic chemistry laboratory techniques and effectively disseminate scientific information.
- **An Understanding Laboratory Safety** – Students will gain a general knowledge of the safety protocols for working with organic chemicals and performing organic reactions. Students will be able to assess a potentially hazardous chemical, access its safety data sheet, then devise a plan to handle that substance in accordance with proper protocol. A specific emphasis will be placed on handling organic chemicals, which can be flammable, potentially explosive, and highly toxic.
- **Synthesis of Molecules** – Students will be able to set up a variety of chemical reactions in accordance to safe and proper protocols. Students will be able to monitor the progress of a chemical reaction, isolate and purify organic products, and use both physical and spectroscopic data to characterize and identify these reaction products.
- **Operation of Scientific Equipment** – Students will learn both the theoretical basis and hands-on operation of various scientific instrumentation including: the operation of a gas chromatograph, mel-temp apparatus, refractometer, and infrared spectrometer.

### **The Laboratory Notebook**

During the Chemistry 235 laboratory you must preliminarily outline (experiment title, date, introduction, theory) and report experimental procedures/data/results/conclusions for each experiment in your laboratory notebook. You must bring this notebook with you each lab period.

#### ***What is the purpose of a laboratory notebook?***

The laboratory notebook allows confirmation/replication of experimental results and findings. If properly signed and dated, the notebook also establishes intellectual ownership and verifies first to invent. The laboratory notebook can be used as legal evidence in judicial proceedings and patent applications.

#### ***Who owns the laboratory notebook?***

If you are carrying out research or laboratory testing procedures for a company (e.g. pharmaceutical company) or within academia, the corporation/institute that sponsored (financially or intellectually) or sanctioned your research/work has ownership of the laboratory notebook. For Chem 235, you will be considered the intellectual stakeholder and will have ownership of your own laboratory notebook.

***What should be included in the Chem 235 laboratory notebook?***

Given below are some general guidelines of things to include in the laboratory notebook. Your lab TA can give you additional tips and specifics for keeping your notebook.

- The ***Experiment Title and Date, Introduction, Theory, Table of Reagents, and Pre-lab Questions (Items 1-5 below)*** sections constitute your experimental outline and must be completed before you may begin work on the experiment.
- The ***Experimental Procedure, Results, Data/Calculations, and Conclusion*** sections must be completed as you work through the experiment.
- ***Post-lab Questions*** can be completed once you have finished the experiment.

1. **Title and Date:** Include experiment title, date, numerical designation, pertinent literature references, etc.
2. **Purpose:** State the purpose of experiment or a short statement of what will be covered/studied during the experiment and why it is important.

Should include ***“hypothesis-type”*** statements such as “it is expected that” or “the results should show.”

3. **Theory (Reactions and Mechanisms/Techniques and Concepts studied):** This includes chemical reactions with mechanisms, instrumental theory, and equations pertinent to the experiment.
4. **Table of Reagents:** Construct a tabular list of compounds that will be used with pertinent physical properties (e.g. molar masses, densities, melting point, etc.). Also list any relevant safety data associated with a particular reagent.
5. **Pre-lab Questions**
6. **Experimental Procedure and Results:** This is a step-by-step written account of the procedure recorded as you perform experiment. Record what YOU do during the experiment, not simply what the lab manual says to do. Record: weights of materials actually used, record YOUR raw data, experimental results, and observations. You can include charts, tables of data, calibration information, repair, or maintenance information as appropriate.

This will include ***“experimental-type”*** statements such as “30.0 mL of liquid acetone was added to 1.3 mg of solid sample #1” or “it was found that the solution turned blue after 10 minutes.”

7. **Data and Calculations:** Record your data collected during the lab (i.e., melting point, boiling point, refractive index of the product) and any calculations (i.e., theoretical yield, percent yield).
8. **Conclusion:** This is a statement summing up the experiment, explaining the data and why the experiment did or did not work for you, list possible sources of error and how such an error could affect the results. Make suggestions for improving the procedure or your performance.
9. **Post-lab Questions**

### ***Some laboratory notebook Do's***

- Do use a pen.
- Do include a Table of Contents on the first 1-2 pages. Leave the first 1-2 pages blank and update the Table of Contents throughout the semester.
- Do include the date, experiment title, and page number on each page.
- Do sign and date each new entry. Best date: 12 May 2016 NOT 5/12/2016 which can be mistaken for 5 Dec. 2016 in Europe.
- Do begin a new experiment on a blank page.
- Do fix errors by drawing a single line through the incorrect entry and writing the correction above or below the incorrect entry.
- Do initial and date the correction.
- Do include a description and/or drawing of any apparatus used.
- Do include usual (temperature, ambient pressure, etc.) and unusual (power outage, fire, excess humidity, etc.) laboratory conditions.
- Do list your name on the outside and inside cover.
- Do list some type of contact information on the inside cover in case of loss.
- Do include the course title, semester date, section number, desk number, teaching assistant name (supervisor/project director in industry/academia), lock number, and room number on the inside cover.

### ***Some laboratory notebook Don'ts***

- Don't use pencil.
- Don't erase or use whiteout to delete entries.
- Don't scribble over or write over mistakes. Draw a single line through an incorrect entry, and write the correction above/below. Initial and date the correction.
- Don't skip pages or leave pages blank. If a page or portion of page is left blank, place a large X on the entire blank area.
- Don't rip out pages.
- Don't record data on scraps of paper. Record all data in the laboratory notebook.
- Don't record data/observations at a later time. Record as the experiment is completed.
- Don't worry about having a pristine notebook. Your notebook is a working record where you can record observations, ideas, and notes.