Chemistry 236 Syllabus
Organic Chemistry II Laboratory
West Virginia University
Summer 2018

REQUIRED LAB MATERIALS:

- Spiral Bound Organic Chemistry Lab Notebook with Carbonless Duplicate Pages
- Sapling Labs Subscription. If you purchase the lab notebook from the WVU Bookstore, it has a Sapling access code included inside.

Pre-Requisite: Chem 233/235 **Co-Requisite:** Chem 234

GENERAL INSTRUCTIONS:

- Laboratory Room: You can find your lab room assignment by going to the Chem 236 eCampus page and clicking the "My Grades" link on the left. Your lab room will be posted here prior to the first lab meeting. You will also need this room number, as it will serve as your Sapling course key code.

- Experimental Procedure: A pdf file for each experiment can be accessed and downloaded on Sapling. **You are responsible for printing out and bringing the experimental procedure to lab with you each period.**

- 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.

- 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 236.

- Pre-Lab Assignments: You are responsible for completing an online pre-lab assignment prior to each laboratory period. The pre-lab assignments are available on Sapling. You should read over the entire experiment and complete the pre-lab prior to coming to lab. Each pre-lab assignment will close at the start of the laboratory period (9:30 am). You will not have the opportunity to complete the pre-lab after that time.

- Final Exam: The laboratory final exam will cover material from the first lab to the last lab. Study your Sapling pre-lab assignments 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.

Chemistry 236 Schedule of Experiments
Summer 2018

Week	Date	Experiment	Subject
1	June 26		*No Lab*
	June 27		*No Lab*
	June 28		Check-In Laboratory Safety Discussion Laboratory Notebook Discussion
2	July 3	14	The Diels-Alder Reaction
	July 4		*No Lab – Independence Day*
	July 5	15	Synthesis of a Polymer: Nylon-6,6
3	July 10	16	Electrophilic Aromatic Substitution
	July 11	17	Aromatic Side Chain Oxidation
	July 12	18	Arene Diazonium Ion Reactions
4	July 17	19	The Grignard Reaction
	July 18	20	A Solvent Free Wittig Reaction
	July 19	21	Synthesis of an Analgesic: Aspirin
5	July 24	22	The Fischer Esterification
	July 25	23	The Aldol Condensation
	July 26	24	Qualitative Organic Analysis
6	July 31	24	Qualitative Organic Analysis
	Aug 1		Lab Final Exam TA Evaluations Checkout
	Aug 2		*No Lab*

Grade Calculation	
Notebook and Experimental Results	50%
Sapling Pre-Lab Assignments	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.

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

TA: _____

Email:_____ Mailbox: 217 Clark Hall

Expected Learning Outcomes

The second semester organic chemistry laboratory course is designed to further enhance the understanding of organic chemistry through experimentation, chemical synthesis, and data interpretation. The skills acquired in the two-semester organic chemistry laboratory sequence 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 236 laboratory course, students will have the following proficiencies, which further build upon the skills acquired during the first semester, organic laboratory course:

- Effective Scientific Communication Skills – Students will continue to advance their scientific vocabulary and ability to disseminate scientific information. Students will be able to keep an accurate scientific notebook describing the synthetic transformations carried out in the laboratory.
- An Understanding Laboratory Safety – Students will continue to gain hands-on experience in working with and handling hazardous organic compounds. Students will be able to set up the equipment and glassware required to safely and effectively carry out an organic reaction.
- 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. Specific reaction techniques employed in the Chem 236 laboratory include: handling air/moisture sensitive compounds, inert gas techniques, and solvent free reactions.
- Interpretation of Spectroscopic Data – Continuing from Chem 235, students will be able to analyze both infrared and NMR spectroscopy data to elucidate the structures of unknown organic molecules.
- Operation of Scientific Equipment – Students will learn both the theoretical basis and hands-on operation of various scientific instrumentation including: the mel-temp apparatus, refractometer, and infrared spectrometer.

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.*

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."*

The Laboratory Notebook

During the Chemistry 236 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 your notebook with you to each laboratory.

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 236 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. You will find a sample notebook writeup on the laboratory website.

- ***Experiment Title and Date, Introduction, Theory, Table of Reagents, and Pre-lab Questions -*** These sections constitute your experimental outline and must be completed before prior to the experiment.
  - **Title and Date**: Include experiment title, date, numerical designation, pertinent literature references, etc.
  - **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."
  - **Theory (Reactions and Mechanisms/Techniques and Concepts studied):** This includes chemical reactions with mechanisms, instrumental theory, and equations pertinent to the experiment.
  - **Table of Reagents:** Construct a tabular list of compounds that will be used with pertinent physical properties (e.g. molar masses, densities, melting point, ect.). Also list any relevant safety data associated with a particular reagent.
  - **Pre-lab Questions**
- The ***Experimental Procedure, Results, Data/Calculations, and Conclusion*** sections must be completed as you work through the experiment.
  - **Experimental Procedure:** 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."
  - **Results, 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).
  - **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.
- ***Post-lab Questions*** can be completed once you have finished the experiment.