CHEM 2463 **Organic Chemistry Lab III** **Spring 2019**

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Office hours: Open door

Lab meets: Mon - Wed

Lab: Olin 232

Required Materials:

Text: Laboratory Techniques in Organic Chemistry, Fourth Edition
Mohrig, et. al., W.H. Freeman and Co., © 2014, ISBN 978-1-4641-3422-7 (Techniques - ***required***)

Students will be **required** to wear safety ***goggles*** and ***lab coat*** during lab.
A laboratory notebook (see lab notebook requirements)
Canvas Access (labs and postlabs will be posted to Canvas)

Additional References available:
https://www.organicdivision.org/links/ Synthetic Organic Chemistry

Course Philosophy:
This course is designed according to the educational goals and mission of the University of Denver and the Chemistry Department. The chemistry department's mission is to develop confident, well-prepared students who can contribute to the society on issues concerning modern chemistry and science. Students are expected to develop strong oral and written communication skills, to engage in critical thinking, to develop excellent laboratory skills, to work on independent and group research projects, and to prepare for careers in industry, academia, and professional areas.

In keeping with this mission this course aims to develop the following skills:

1. Know and use standard lab techniques.
2. Know and use basic analytical tools, techniques, and instrumentations.
3. Use and critically analyze chemical literature.
4. Communicate scientific issues in writing.
5. Apply current chemical theory and content to solving problems.
6. Investigate some applications of organic chemistry.

Organic Chemistry III Lab will meet these goals by:

1. Reinforcing the common techniques and procedures used in organic chemistry I and analytical techniques introduced in organic chemistry II.

2. We will use the chemistry reference materials to identify chemical properties and hazards associated with each chemical that we use and make in the lab. Part of each pre-lab assignment is to gather this information into a table in your lab notebook.

3. Being able to effectively communicate an understand chemical theories in writing is essential to all practicing scientists, and one way to establish these skills is through practice. Therefore, each lab will include a post-lab or lab report assignment which will ask you to effectively communicate your lab results, the interpretation of these results, and to explain the relevant chemical theories applicable to that lab.

Organic Chemistry III Laboratory

For organic chemistry III, we will work on named reactions and a couple of projects. But first, we will learn how to use a common database called SciFinder(n) to obtain primary literature references and to do searches. Typically, a good literature search is a natural first step performed by a chemist before heading to the lab to run any reaction and SciFinder is a key database used by organic chemists. The lab activity on SciFinder will show you how to search for known compounds, reaction procedures, vendors, analytical data, and even research a scientific topic of interest.

Google Scholar is another popular web search engine also used by chemists to explore scholarly literature across many related disciplines, databases, and sources. Though we will not be dwelling on Google Scholar this quarter, it is worth

mentioning here that it is a free tool and good starting place to search for articles and we will touch on search results using this search engine in our SciFinder activity.

Parts of a Lab Assessment

Pre-lab assignments:

Each lab will have a pre-lab or before-you-begin (BYB) assignment to be completed in your laboratory notebook before the start of the lab. Note that each prelab will include a reading assignment that introduces you to the lab topic. I expect you complete this reading before coming to lab. For the lab projects, you will read a couple of research papers and plan your reactons with your group before coming to lab.

You should also know that **the labs will be standalone** – that is, the lab topics/project might not have been covered in lecture, but the materials and resources (the techniques book, lab procedure, and SciFinder search) given to you are sufficient for the lab. Again, I expect you to read the research papers, the lab procedures, the techniques book, plan and then do the lab and answer the post-lab questions that follow. A one or two-page summary of the assigned reading will be worth 10 points for the prelabs.

Doing the Lab and Lab Performance:

Organic chemistry labs are not optional and there are no substitutes assignments for the labs. You are expected to show up to the lab and do each experiment to earn points for the lab. **There will be no makeup labs or lab substitutes**. This part of your grade will be for actually doing the lab and how prepared you are for the lab. 20 points will be for showing up and doing the lab and another 20 points for readiness. To earn all 20 points for lab performance you should be prepared for the lab, pay attention to lab techniques, safety, cleanliness, and complete the lab in a timely fashion. You will lose points if you do not have a lab procedure ready, use your cell phone in the lab, spilled chemicals, leave drawers unlocked, behave inappropriately, use equipment incorrectly, or leave your equipment/ glassware outside your drawer at the end of lab. All shared glassware must be washed and returned to the designated location after each lab.

Note: safety monitor points will only be given after the stockroom workers and the TA and students of the next lab period agree that the common lab areas were thoroughly cleaned, and the lab was left in good order and condition.

Post-lab assignments (Reports):

Each lab will have a post-lab assignment or report due at the **beginning of lab** or on Canvas according to the schedule. Post-labs should be typed unless told otherwise. Turned in late post-labs or reports will lose points according to the following guidelines: 1-day late penalty would be minus five points, 2-days late minus 10 and 3-days late minus 15 points. A week late from the due date would be minus 30 points.

Course Grading:

Your score in the course will be determined using a point system below:

Areas evaluated:	*Frequency × Points*	*Total Points in Area*	*Percentage of Grade*
SciFinder Activity	80	80	*8%*
Pre-lab (Reading summary is worth 10 pts)	2 × 20	40	4 %
Doing the Lab and Lab performance	2 × 40	80	8 %
Post-lab or Reports	2 × 60	240	24 %
Safety Monitor	60	60	6%
Lab Project	500	500	*50%*
Total Points		*1000*	*100%*

Grade	Range	Grade	Range
A	**100 – 94 %**	**C-**	**<74 – 70%**
A-	**<94 – 90%**	**D+**	**<70 – 67%**
B+	**<90 – 87%**	**D**	**<67 – 64%**
B	**<87 – 84%**	**D-**	**<64 – 61%**
B-	**<84 – 80%**	**F**	**<60 – 0%**
C+	**<80 – 77%**		
C	**<77 – 74%**		

Note: Final grades and percentage ranges are subject to change by the instructor

Retain all returned graded coursework until final grades are assigned at the end of the course. Please keep all graded assignments until a final grade has been assigned for the course. It is YOUR RESPONSIBILITY to check for grading errors. Individual scores will be posted on Canvas as soon as they become available.

Laboratory Safety:

The mastery of chemistry requires the student to master laboratory skills and the handling of chemicals with various levels of associated hazards. The University has taken the necessary steps to minimize student risks by equipping chemistry labs with devices that lower student exposure to hazardous chemicals as well as a vibrant set of safety procedures, guidelines and requirements. However, we expect you to embrace and follow all safety procedures outlined in each experiment and to develop safety guidelines for group projects. Failure to comply will result in an automatic zero for that lab and repeated problems can result in an **F** grade for the course.

Attendance:

Regular attendance is expected. You must be in the lab at the assigned starting time to receive full credit for the lab. **There will be no makeup labs**.

Academic Integrity:

While I advocate collaborative learning and teamwork, I also firmly believe that everyone should maintain the highest ethical standards. As such, I support and will strictly enforce the Honor Code of the University of Denver. www.du.edu/honorcode.

Labs: *Note - the labs might change*

Date	Lab		Assignments Due	Reading (techniques book)
Wk1	Introduction to Organic chemistry lab Check-in, Safety, SciFinder Activity and Syllabus			*Chapter 1*
Wk2	Lab 1	Check-in, SciFinder Activity & Lab Project Assignment	SciFinder Activity	*SciFinder and Lab Project*
Wk3	Lab2	Heck Reaction Planning for Lab Project Ordering of chemical	Pre-lab 1 (30 pt) SciFinder Activity	*See Pre-Lab* *Research papers*
Wk4	Lab 3	Domino Reaction Planning for Lab Project Ordering of chemical	Pre-lab 2 (30 pt) Post-lab1	*See Pre-Lab* *Research papers*
Wk5		Projects	Prelab & postlab2	*Research papers*
Wk6		Project	prelab	*Research papers*
Wk7		Project	prelab	*Research papers*
Wk8		Project	prelab	*Research papers*
Wk9	May 27 Memorial Day	Presentation, Report and Checkout	Report	

Project Breakdown: Literature **S**earch, Reaction **P**lanning, **E**xperimentation, **R**eport and Presentation

- Research on your topic and experiment.
- Write a summary or overview of your reactions (or write-up a plan, timeline, and chemical supplies for your experiment). Include references and detain reaction schemes.
  Ask yourself the following questions as your plan:
  What chemicals do I need for my reaction? How do I set up my reaction and obtain the right reaction conditions? What do I need to set up my reaction? Can I do each step of my planned reaction in the fixed 3-hour period? How do I monitor my reaction? How do I work up my reaction? How do I clean and purify my reaction product? How do I analyze my reaction product? How do I deal with the reaction waste?

- Meet with your TA as often as possible during the planning process. Keep each reaction step simple.
- Submit **a list of all the required chemicals, solvents and supplies** for your project. Obtain the chemicals and other supplies and plan to start the experiments.
- Perform each step of the reaction and obtain major and minor products. Analyze each product and document your data and interpret results.