CHM 244: Organic Chemistry Laboratory

Syllabus, Summer 2017

Instructor: **Professor Ben Gung**
Office: 260B Hughes Laboratories (2nd floor, same floor as the lab)
Telephone: (513) 529-2825
E-mail: gungbw@miamioh.edu
Office Hours: email for appointment

Teaching Assistants

Mr. Roy Ma
253 Hughes Hall
Phone: 513-529-2813
Mar4@miamioh.edu
Office Hours: email for appointment

Laboratory:

Monday, Tuesday, and Thursdays, 12:45‑3:35, 279 Hughes Laboratories

Course Objectives

The goal of CHM 244 is to introduce you to the practical aspects of organic chemistry: the techniques used by organic chemists to synthesize new compounds, to characterize their structures, and to understand their properties and reactivity. This is a hands-on course, but it aligns with the concepts discussed in the co-requisite CHM 241 lecture course.

More specifically, in this course you will learn:

1. Skills for setting up reactions for the synthesis of new organic compounds.

2. Techniques for the purification of organic compounds out of mixtures.

3. The use of various methods to characterize organic compounds, especially infrared and nuclear magnetic resonance spectroscopy.

4. To keep a laboratory notebook.

5. The beginnings of writing formally in chemistry.

Course Materials

· The textbook for CHM 244 is ***Experimental Organic Chemistry*** **by Daniel R. Palleros**. It contains the procedures used for many of the experiments, and, more importantly, is an excellent resource for learning the practical aspects of organic chemistry.

· You will also need a **Laboratory Research Notebook** by Jones and Bartlett, which you will purchase on check-in.

· Miami has a site license for **ChemDraw**, the industry-standard program for drawing chemical structures. As a student in organic chemistry, you will need to be familiar with its use. We will take the first steps in this direction this first half of the summer. Instructions for downloading ChemDraw will be posted on the Canvas site.

· As part of the CHM 241 textbook package, you should have a **molecular model kit**. We will use this during the first lab period.

The course has a website, which can be accessed through a link on Canvas. You can bookmark it after first access. You have to login with your Miami email and your Banner number without the + and the 0. All handouts, assignments, various resources for you to succeed in this course will be found at this site. This website will be periodically updated.

Lab Protocols

Prelab Assignments

Before a lab, you will typically review content on the CHM 244 website, read from the lab manual, and prepare your notebook. *Before* your lab, you will usually have to have the following prepared in your notebook (will be checked by the TA):

1. A descriptive **Title**.

2. A short **Introduction** that states the major purposes of the experiment.

3. A **Preliminary Data** section that includes:

· A table of chemicals to be used with the following information (see p. 37 of Palleros for an example):

· Molecular weights

· Physical data (melting points, boiling points, densities, etc., as appropriate)

· Balanced chemical equations for all reactions to be carried out (if applicable).

4. A **Procedure** section that outlines the procedures to be followed. *Do not copy the lab manual procedure.* Instead, summarize the procedure in your own words leaving space for entries you will make during the lab period. Your procedure should reflect changes described in the handouts for each experiment.

There may also be prelab questions and quizzes.

Lab Periods

During the lab, you will complete the experiment, recording your data in the spaces left in your prelab work (weights, melting points, observations of color, precipitates, etc.). Changes in notebook entries necessitated by procedural changes or errors can be made by striking through the material to be changed with a single black line.

Do not erase or obfuscate anything in your lab book. Before you leave the lab, it should be possible for someone to repeat the experiment using only the information written down in your notebook.

At the end of each lab period, your TA must sign your notebook pages.

Postlab Assignments

A separate **Results** section summarizing the major experimental results of each experiment and answering any postlab questions should be prepared in the notebook after the experiment is complete. You will typically be required to calculate the percent yield or percent recovery of all products as part of the notebook report for each experiment. You must provide all data necessary to carry out this calculation and show how the calculation was performed in the notebook.

Labs will usually be due the week following completion of the lab, at the *beginning* of the lab period.

Note. Skill check-out is required for the operation of rotary evaporator, and IR. Student needs to be checked out individually by your TA when you are confident enough to perform the technique. Each skill is worth 30 points.

Grading

- Lab reports: 10 × 20 = 200 points
- Skills (rotary evaporator and IR): 2 × 30 = 60 points
- Quizzes: 8 × 5 = 40 points
  Spectroscopy: 60 points
- Total: 360 points

A ≥90%, B ≥80%, C ≥70%, D ≥60%. These cutoffs may be adjusted downward at the instructor's discretion. Plus/minus grades may be given below these cutoffs.

Schedule

Date	Week	Topics	Experiments
5/16	1	Safety quiz, buy safety goggles	Unit 1, safety guidelines
5/18	1	Models in chemistry (20)	Expt. 1: handout
5/22	2	Recrystallization (20)	Unit 4, E4.1, pp 80
5/23	2	Extraction (20)	Unit 5: E5.3, pp 109
5/26	2	Finish up	
5/29	3	Memorial Day	No lab
5/30	3	Infrared (IR) spectroscopy (20)	Unit 31: IR, handout
6/1	3	IR assignment (in lab, 20)	
6/5	4	Thin Layer Chromatography (20)	Unit 8, pp 172 & handout
6/6	4	Column chromatography (20)	Unit 9, pp 197 & handout
6/8	4	Mass spectrometry (in lab, 20)	
		Mass Podcast link on Canvas	
6/12	5	Williamson Ether Synthesis (20)	Unit 15: E15.3, pp 330
6/13	5	Reduction of Benzophenone (20)	Unit 21: E21.1, pp 451
6/15	5	Nuclear Magnetic Resonance (in lab, 20)	
		NMR podcast link on Canvas	
6/19	6	Synthesis I (20)	Synthesis I, TBA, handout,
6/20	6	Synthesis II (20)	continuation
6/22	6	Finish report, check out	Check-out, Report due on Synthesis

Safety

On the first day of lab, you will be asked to sign a safety contract with the following stipulations:
1. Safety goggles must be worn by everyone (including visitors) upon entering the laboratory.
2. *Never* taste chemicals. *Never* touch chemicals with your hands.
3. Your apparel should be appropriate for laboratory work. No open-toe shoes or sandals are permitted. Long hair must be secured away from the face.
4. Everyone should be alert and proceed with caution at all times in the laboratory. Take care not to bump another student and remain at your lab station while performing an experiment.

5. Only lab manuals and lab notebooks are permitted in the laboratory. Books, purses, and backpacks should be placed in the storage area provided.
6. No food, beverages, or smoking is permitted.
7. You should know the location of fire exits and proper fire drill procedures.
8. Work areas should be kept clean and tidy. Always clean and wipe dry all apparatus and laboratory work area at the conclusion of each laboratory experiment.
9. Hands should be washed thoroughly at the end of each lab experiment.
10. Everyone should recognize and heed all safety symbols and cautions incorporated in the procedures of the laboratory experiments.
11. You shall obey the specific safety precautions of your laboratory instructor.
12. If you have a question regarding safety, you will ask a laboratory instructor.
13. All accidents, no matter how minor, must be reported to the instructor immediately.

Academic Integrity

The Student Handbook, § 1.5, states the Miami University commitment to academic honesty. Two important statements are:

Academic and other forms of dishonesty violate the spirit of the values espoused by Miami University and undermine the value of a Miami education for everyone, especially for the person who is dishonest.

Students are responsible for knowing and understanding these standards; misunderstanding of the appropriate academic conduct will not be accepted as an excuse for academic dishonesty.

Violations of the Academic Integrity policy can result in penalties ranging from grade reductions to suspension, dismissal, or expulsion from the University. It is important that you familiarize yourself with the regulations in the Student Handbook. Cases of academic misconduct (e.g., cheating on exams, turning in copied work) will be immediately reported to the chair of the department.

In this course, possible forms of Academic Misconduct include (but are not limited to):

- Turning in lab reports copied from another student.
- Falsifying or copying data.
- Copying from another student during an exam.
- Use of notes or an internet-connected device during an exam.
- Modifying an exam and submitting for regrading.

May 2017

◄ April | June ►

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16 Class starts Check in Safety quiz	17	18 Molecular Modeling	19	20
21	22 Recrystalization	23 Extraction	24	25 Finish up	26	27
28	29 Memorial Day No Class	30 IR	31	**Notes:**		

More Calendar: Jun, Jul, PDF Calendar

June 2017

◄ May | July ►

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1 IR assignment (in lab)	2	3
4	5 TLC	6 Column	7	8 Mass spec assignment (in lab)	9	10
11	12 Williamson Ether synthesis	13 Reduction of benzophenone	14	15 NMR assignment (in lab)	16	17
18	19 Synthesis I	20 Synthesis II	21	22 Finish up and check out	23	24
25	26	27	28	29	30	Notes:

More Calendar: Jul, Aug, PDF Calendar