

**S343: Honors Organic Chemistry I
Spring 2015**

Instructor: Dr. Ben Burlingham

Contact info: Office: Chemistry A206 Phone: 856-7782

I prefer email at bburling@indiana.edu. Please include S343 as the subject.

Office Hours: MT 9-10AM, WR 12:15-1:15PM

Course Website: <http://courses.chem.indiana.edu/s343/default.asp>

Associate Instructors:

<u>Section</u>	<u>AI</u>	<u>email</u>	<u>Office Hours</u>
34771	Xiaoxiao Qiao	xiaoqiao@indiana.edu	F noon-1PM
22875	Ziran Li	zirli@indiana.edu	T 2-3PM
22876	Mitchell Stadler	mcstadle@indiana.edu	M 2-3PM

Course Structure: Lecture will meet in CH001 TR 11:15AM for lecture. Each student will attend one lab section per week in CH145.

Attendance: Attendance will not be taken during the lecture. The student is responsible to obtain any material missed during the absence. Any unexcused absences for quizzes or exams will result in a zero for that grade. There will be no make-up quizzes or exams offered.

Laboratory attendance is mandatory. There will be no make-up lab sessions. No report may be turned in for labs that were not completed during the given lab times. All such reports will result in scores of zero. With an appropriate excuse and instructor permission prior to missing lab, one lab score of zero due to absence may be replaced by the average of all lab scores for the final grade. An additional report may be required to make up for work missed. Missing more than one lab may result in withdraw or failure for the course.

Required texts: Techniques in Organic Chemistry, 4th ed. By Mohrig, Hammond, and Schatz (ISBN 978-1-4641-3422-7)

Additional text: Your lecture textbook, written either by Loudon or Klein.

Required Supplies: approved safety goggles, lab notebook

Laboratory Goals:

- Follow experimental procedures while observing all rules regarding safety
- Understand theory of basic organic laboratory techniques, spectroscopy, and chromatography
- Employ basic laboratory techniques, spectroscopy and chromatography in experimental protocols
- Use spectroscopy in problem solving and characterization
- Learn the proper use of a lab notebook in keeping neat and accurate records of all experiments conducted
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Safety:

Safety is the number one priority in the chemistry lab. In order for you to have an enjoyable experience, there are some fundamental rules of lab safety that must be followed AT ALL TIMES. These rules will be reiterated during lab on the first meeting. All students must sign a **Safety Rules** sheet at the beginning of the semester. Intentional or reckless failure to comply with all safety rules may result in dismissal from the course with a failing grade.

1. An A.I. must be present at all times when students are in the laboratory.
2. Safety goggles must be worn over the eyes at all times while in the lab, even when no chemicals are present. No safety goggles may be kept in the drawers of the lab bench.
3. Inform your A.I. if you wear contact lenses.
4. No head phones, music devices, cell phones, or any related electronics may be used at any time in the lab. These must be left outside of the lab or secured in a closed backpack during the laboratory session.
5. No smoking, drinking, or eating (including gum) is allowed at any time in the lab.
6. All students must sign a Safety Rules sheet at the beginning of the semester.
7. No lab gloves may be worn outside of the lab.
8. Any misuse of chemicals or equipment or endangerment of any student will result in dismissal from the course.
9. Students must arrive to lab on time to be allowed to complete the lab without penalty. Students will receive a 5% penalty in their lab report for each 5 minutes that they are late. Students that are more than 20 minutes late will not be allowed in the lab and will earn a zero for the week.

10. Lab Attire:

Required lab attire: Goggles (not safety glasses); shirt that covers your shoulders; pants that go to your ankles; closed-toe, closed-heel shoes that cover the entire foot.

Recommended lab attire: Cotton t-shirts or long sleeved shirt; loose-fitting denim jeans or cotton pants; ankle-length skirt; leather shoes or athletic shoes.

Unacceptable lab attire (you will be removed from the lab by your AI or Teaching Lab Staff if you are wearing these items. This may not be a comprehensive list.): Sandals of any kind; ballet flats; crocs; any shoe that leaves the top of your foot (with or without socks) exposed; shorts of any length; capri pants; skirts above the knee; midriff-baring tops; tank tops; sleeveless t-shirts, leggings or other skin-tight pants.

Not-recommended lab attire: Polyester or other synthetic fibers; skirts that fall between the ankles and knees.

Grading:

The final grade will be composed of lab quizzes, formal/informal lab reports, lecture quizzes, and exams according to the following distribution:

Lab reports:	450 pts
Prelab quizzes:	100 pts
Quizzes:	100 pts
Midterm:	100 pts
<u>Final exam:</u>	<u>150 pts</u>
Total:	900 pts

Anticipated grading scale: A = above 90%, B = 80-89.9%, C = 70-79.9%, D = 60-69.9%, F=below 60%. Plus/minus grades will be awarded.

Formal/Informal Laboratory Reports: Because one of the major goals of this course is to learn effective communication skills in the field of chemistry, the lab reports comprise a significant portion of the final grade. To communicate chemical results and conclusions well, one needs first to be able to know what is important to communicate and then be able to communicate in an effective style. Each lab experiment will have directions on completing either an informal (partial) report (such as turning in a copy of the lab notebook and/or a section of a formal report) or a full formal report in the style of the *Journal of Organic Chemistry*. More details are given in a handout.

Hard copies of all lab assignments are due at the beginning of your lab section. For most labs, an electronic copy of the lab must be turned in to Turnitin.com through the assignments tab of Oncourse. This should be done prior to lab. **For the assignment to be considered submitted, you must have turned in BOTH hard copy and electronic copy.** You will receive a 10% penalty for every day you are late.

Prelab quizzes: A fun and educational lab experience depends on the student being highly prepared. The techniques and theory behind each lab will be covered in lecture before lab. It is very important, though, that the student is prepared by reading and understanding the lab as outlined in the handouts before coming to lab. A series of pre-lab questions will be provided with each lab. Students are responsible to write out answers to these questions.

To encourage your preparation, a 10 pt lab quiz will be given prior to the start of most weeks of lab. You are allowed to use your lab notebook and your own hand-written answers to the pre-lab questions while taking the quiz. The average percentage of all your pre-lab quizzes will be given to you as a score out of 100 points.

Quizzes: Quizzes will be given six times throughout the course. Each quiz will be worth 20 points. The lowest quiz will be dropped to give a total of 100 points for quizzes throughout the course. No make-up quizzes will be given. You may receive an excused absence for one quiz if you contact the instructor with a **VALID** excuse prior to missing class. In this case, the average of the other five quizzes will be substituted for the excused quiz.

Midterm exam: The midterm exam will be given on Tuesday, March 3 from 7:15-9:15PM in a room TBA. The exam will be worth 100 points and will cover both lecture and lab material.

Final exam: The final will be given on Thursday, May 7 from 10:15AM-12:15PM in a room TBA. The exam is worth 150 pts. It will include questions from material covered in lecture as well as questions based on the labs you did.

Lab Notebook:

The lab notebook is the foundation for all written assignments for the lab. It serves as a recording of all data and observations made in lab with a few preliminary conclusions. To organize the notebook, save a few pages at the beginning of the book for a table of contents. The lab notebook will be filled out before, during, and after lab in the following format:

Prior to lab:

1. Title
2. Statement of purpose or question
3. Main reaction/table of reagents (if applicable)
4. Experimental procedure

During lab

5. Observations and results

After lab

6. Comments and discussion
7. Summary

Title: Each experiment or multipart experiment should start on a new page. At the top of the page, label the experiment with a short title that summarizes the work to be done in the experiment.

Statement of purpose or hypothesis: After reading the lab background and procedure, write a statement of purpose or an experimental question to be addressed in your own words.

Main reaction/table of reagents: In a synthetic lab, write the main reaction being performed including all reagents and products. Under the main reaction, write the quantitative data for each reagent, including molecular weight, density, gram amount, mole amount, and volume. For a non-synthetic lab, no main reaction is written, but a table of chemical data may be compiled.

Procedure: Before the start of each new experiment, each student must come to lab with the procedure written out in his or her lab notebook. **No text books, handouts, or lab manuals will be allowed into the lab—only lab notebooks may be used.** No student will be allowed to begin the lab until the procedure is written out in the lab notebook. The procedure, however, should not be simply copied from the lab manual. Rather, time should be taken to ensure that each step of the procedure is understood so that each student knows exactly what to do when he or she enters lab.

Observations and results: Thoroughly record what happened during the experiment. Include final mass yields, tables of spectral data, times between changes,

color changes, physical properties (mp, bp, etc.), evolution of gases, temperature changes, and anything else of interest that you note.

Comments and discussion: Soon after the lab is complete, you will write out comments and conclusions from your data that address the purpose of the lab. At this point in your chemistry career, you still need some guidance on what is important to include in your discussion, so guiding questions will be given to you. You should treat these questions as a guide for writing, not a limitation on what you should write. This set of guiding questions is sufficient to do well on the assignment (B-level), but very well written comments and discussion sections (A-level) should go beyond a simple “answer” the questions” approach to integrating and applying data at a level of higher order thinking.

The notebook **MUST** be completed in pen. Nothing should be erased, but simply crossed out if deemed incorrect. Each page should be numbered, signed, and dated. A legible photocopy of the notebook should be turned in for grading on the appropriate days as listed in the syllabus.

Academic Honesty:

The determination of academic misconduct is at the discretion of the instructor. The sanctions may range from deduction of points to a failing grade for the class. In all cases, the infraction will be immediately reported to the Dean of Students as well as the dean or director of the student’s school. Please read the *Code of Student Rights, Responsibilities, and Conduct* for further detail.

Tentative Lecture Schedule: This schedule may be changed by the instructor to better meet the needs of the class.

Date	Topic	Reading guideline (Techniques)	Quizzes
Jan 13	Intro, ChemDraw, MF	Chapter 3	
Jan 15	Mass Spec	Chapter 24	
Jan 20	Mass Spec		
Jan 22	Solvents, Recrystallization, melting point	Chapter 14-15	
Jan 27	Mass Spec/Chromatography	Chapter 18-19	
Jan 29	Chromatography		Quiz 1
Feb 3	GC	Chapter 20	
Feb 5	Extraction, drying	Chapter 10-11	
Feb 10	Distillation	Chapter 12	
Feb 12	Formal Reports	Chapter 28	Quiz 2
Feb 17	IR	Chapter 21.1-21.6	
Feb 19	IR	Chapter 21.7-21.11	
Feb 24	IR		
Feb 26	IR/MS problems		Quiz 3
Mar 3	Review		
Mar 5	Planning Synthetic Procedures	Chapter 7	
Mar 10	NMR	Pp 348-357	
Mar 12	NMR		
Mar 24	NMR	Pp 408-417	
Mar 26	NMR	Chapter 22.4-22.7	Quiz 4
Mar 31	NMR	Chapter 22.9	
Apr 2	NMR	Chapter 22.10	
Apr 7	NMR		
Apr 9	NMR		Quiz 5
Apr 14	NMR		
Apr 16	NMR	Chapter 23.4-23.5	
Apr 21	NMR	Chapter 23.6	
Apr 23	NMR		Quiz 6
Apr 28	Integrated Spectral Problems	Chapter 26	
Apr 30	Integrated Spectral Problems		

Lab Schedule: This schedule may be changed by the instructor to better meet the needs of the class.

Week of:	Lab	Assignment Due in your lab section:
Ongoing	12. Identification of an Unknown	
1-12	1. ChemDraw and check-in	
1-19	2a. Purification of Biphenyl Part 1: Solubility and Recrystallization	ChemDraw handout (25pts)
1-26	2b. Purification of Biphenyl Part 2: Chromatography and Characterization	Exp 2a Notebook (25 pts)
2-2	3. Principles of Extraction	Exp 2b Figures and tables (25 pts)
2-9	4. Dihydroxylation Mechanisms	Extraction Results and discussion (25pts)
2-16	5. Elimination Reactions	Dihydroxylation Introduction (25pts)
2-23	6. Reduction	Elimination experimental (25pts)
3-2	7. Nitration	Reduction abstract (25pts)
3-9	8. Isomerization of Carvone	Nitration Formal Report (50pts)
3-16	Spring break	
3-23	9a. Multistep Synthesis	
3-30	9b. Multistep Synthesis	Carvone Formal Report (50pts)
4-6	9c. Multistep Synthesis	
4-13	10. Aldol reaction	Multistep Formal (100 pts)
4-20	11. Wittig Reaction	Aldol Notebook (25pts) Unknown Handout (25pts) Wittig Notebook (25pts)
4-27	Checkout	