

C344: Organic Chemistry Lab 2 Spring 2015

Instructor: Dr. Ben Burlingham

Contact info: Office: Chemistry A206

Phone: 856-7782 Email: bburling@indiana.edu (preferred)

Course Website: Course handouts and announcements can be found on the course website, <http://courses.chem.indiana.edu/c344/default.asp>. Grades will be posted on Oncourse.

Course Structure: Lecture will meet TR in CH001 TR 8:00-8:50AM. Lab sections will meet weekly according to section.

Instructor Office Hours: MT 9-10AM, WR 12:15-1:15PM in A206 or by appointment

Course objectives:

- Follow experimental procedures while observing all rules regarding safety
- Effectively communicate experimental protocol, results, and conclusions in a formal format
- Understand and apply experimental techniques for mechanistic investigation, such as LFER, stereochemistry, and isotope effects

Associate Instructors:

Meeting time	<u>AI</u>	<u>email</u>	<u>Office hour</u>
M 1:30-6:00PM	Toolika Agrawal	tagrawal@indiana.edu	M 10-11AM
T 1:30-6:00PM	Allison Bergman	allmberg@indiana.edu	F 1:30-2:30PM
W 1:30-6:00PM	Toya Rush	ldrush@indiana.edu	T 10:30-11:30AM

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 exams will result in a zero for that exam.

Laboratory attendance **is mandatory**. No graded assignment may be turned in for labs that were not completed during the given lab times. All such reports will result in scores of zero. If a student has more than one unexcused absence, the student must either withdraw from the course or receive a failing grade for the course. With an appropriate excuse and **PRIOR instructor permission**, a student might be able to attend another lab time to complete the experiment. If this is not possible, the student and instructor will work out appropriate arrangements.

Students are expected to be on time for lab. If the student does not arrive by the set beginning time of class, it is up to the judgment of the AI whether or not to allow entrance to the student. Ongoing problems with tardiness will be addressed by the instructor, with penalties ranging up to failure for the course.

Required texts: ACS style guide

Additional text: Your lecture textbook from C342/S342
Your lab book from C343/S343

Required Supplies: approved safety goggles, lab notebook. The lab notebook may be either a composition type notebook or a carbon-copy notebook.

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 given 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.

Grading: The final grade will be composed of lab notebooks, formal lab reports, and exams according to the following distribution:

Biginelli lab Notebook	50 pts
Phe Substitution Formal Report	100 pts
Choice Formal (2x100pts each)	200 pts
Choice Poster	50 pts
Mechanism Exam	100 pts
<u>Lab Notebook exam</u>	<u>100 pts</u>
Total:	600 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. **Late Penalty:** Assignments will receive a 10% deduction for being late, with an additional 10% penalty every 24 hours.

Formal 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. Formal reports will be type written and in the format of an article from *The Journal of Organic Chemistry*. All reports will be turned in as a hardcopy and through TurnItIn.com (more details to follow.)

A total of three formal reports will be submitted. All students will turn in a formal report for the Phenylalanine Substitution Reaction during their lab period on the week of February 9. The student will choose two of the additional experiments throughout the semester and write formal reports for those labs as well. **Grade forgiveness:** If the student is not satisfied with his grade on any lab report, he may choose to write an additional lab report(s) for other experiment(s) of his choice. These additional reports will replace the lowest report grade if it will improve the students overall grade.

Poster The student will choose one experiment for which he has not written a formal report, and will submit a scientific poster for that experiment. **Grade forgiveness:** If the

student is not satisfied with his grade on the poster, he may choose to make an additional poster for an experiment that he has not written a formal report. This additional poster will replace the first poster grade if it will improve the students overall grade.

Lab Notebook: A lab notebook will be written for all experiments. A copy of the lab notebook for the Biginelli experiment will be turned in at the end of lab on the week of January 26 for grading.

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: 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 or carbon copy of the notebook should be turned in for grading on the appropriate days as listed in the syllabus and with every formal report.

Exams: An exam covering the theoretical aspects of mechanistic experimentation will be given during class on March 12. Students will be allowed to start at 7:30AM.

A final lab notebook exam will be given during the scheduled finals period, Thursday, May 7, 8-10AM. For this exam, you will be allowed to use your lab notebook, but no other loose papers or notes. This exam is designed to test how well you kept your lab notebook throughout the semester.

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.

Principles of academic honesty:

- If an assignment is turned in for points and has only your name on it, it should represent work that you (and no one else) contributed
- If an assignment is not turned in for credit, you may work with anyone in any way you want, but it is in your best interest to do the work by yourself or working with others in such a way that you are the one gaining understanding from the work.
- If you include information on an assignment from any source, you must cite that source

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

Date	Lab	Assignment Due in your lab section:
Week 1: Jan 12	Check-In Biginelli reaction	
Week 2: Jan 19	MLK Jr Day	
Week 3: Jan 26	Phenylalanine substitution	Biginelli notebook
Week 4: Feb 2	Continue Phenylalanine substitution	
Week 5: Feb 9	Suzuki Cross coupling	Phe Substitution Formal Report
Week 6: Feb 16	Stereochemistry of Benzil reduction	
Week 7: Feb 23	Stereochemistry of Benzil reduction	Suzuki Formal Report (optional)
Week 8: March 2	Elimination of Tosylates	Benzil Reduction Report (optional)
Week 9: Mar 9	Elimination of Tosylates	
Week 10: Mar 23	Kinetic vs Thermodynamic control	Elimination of Tosylates Report (optional)
Week 11: Mar 30	Kinetic vs Thermodynamic control	
Week 12: Apr 6	Solvent KIE of hydrolysis	Kinetic vs Thermodynamic Report (optional)
Week 13: Apr 13	LFER competition	Solvent KIE report(optional)
Week 14: April 20	LFER competition	
Week 15: Apr 27	Checkout	LFER report (optional)

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

Week	Date	Topic
1	Jan 13	Purpose in Scientific Writing
	Jan 15	Introduction, experimental
2	Jan 20	Literature, ethics
	Jan 22	Results, discussion, abstract
3	Jan 27	Posters and communication
	Jan 29	Investigating mechanism; arrow pushing
4	Feb 3	energy diagrams; MOFJ
	Feb 5	K vs T control and borderline mechanism
5	Feb 10	Crossover experiments
	Feb 12	Kinetics
6	Feb 17	General and Specific acid
	Feb 19	KIE
7	Feb 24	KIE and pericyclic reactions
	Feb 26	LFER
8	Mar 3	LFER
	Mar 5	Analyzing data in mechanism
9	Mar 10	Analyzing data in mechanism
	Mar 12	Mechanism Exam
10	Mar 24	Report writing
	Mar 26	Report writing
11	Mar 31	Report writing
	Apr 2	Report writing
12	Apr 7	Report writing
	Apr 9	Report writing
13	Apr 14	Report writing
	Apr 16	Report writing
14	Apr 21	Report writing
	Apr 23	Report writing
15	Apr 28	Lab notebook Exam review
	April 30	Lab notebook Exam review