

Description: A one-semester-hour laboratory course designed to accompany organic chemistry lecture.

Pre-requisites: Grade of 'C-' or better in Chem 223 and Chem 225

Co-requisite: Chem 224

Materials: Making the Connections³ By Anne B. Padias (ISBN: 978-0-7380-7436-8)
Permanently-Bound, Duplicate-Page Notebook
Full-length lab coat
Safety goggles (will be provided during safety training if you need a new pair)

Course Homepage: Announcements, assessments, extra copies of the handouts, the grade book, etc. are posted on Sakai.luc.edu.

Grading: Course grades consist of the following components:

Online Safety Training	5 pts
9 Weekly Online Pre-Lab Safety Checks, 1 pt each	9 pts
Best 8 of 9 Pre-lab Quizzes, 6 pts each	48 pts
Best 8 of 9 Notebook Scores, 5 pts each	40 pts
Best 8 of 9 Product Points, 6 pts each	48 pts
2 In-class Exams, 100 pts each	200 pts
Spectroscopy Unknown	<u>50 pts</u>
	400 pts total

A>94%, A->90%, B+>88%, B>84%, B->80%, C+>78%, C>74%, C->70, D+>68%, D≥60%, F<60%

Online Safety Training: All students must watch the presentation posted on Sakai and score 5/5 on the Safety Training Quiz before being allowed to work in the laboratory. There are unlimited attempts.

Weekly Online Pre-lab Safety Check: Before each experiment, all students must watch the Safety video posted on Sakai and score full credit on the Online Pre-lab Safety Check. If the Safety Check is not completed, the student will not be allowed to perform the experiment. There are unlimited attempts.

Pre-Lab Preparation: Success in organic lab depends on advance preparation. Therefore, there are several things that students must do before coming to lab. One major component of the pre-lab assignment is to thoroughly read and understand the experimental procedure. If there are techniques mentioned in the procedure that a student does not recall from first semester organic chemistry lab, the student should consult the background readings on techniques in the Padias text as necessary.

Notebooks: The ability to keep good records is a valuable skill. Before coming to class, the pre-lab portion of your lab notebook must be completed. The Instructor/TAs will be checking notebooks before each experiment. Anyone who has not completed the pre-lab portion of the notebook will not be allowed to perform the experiment. The lab notebook format is posted on Sakai and there is also a description of how to complete a lab notebook in the Padias text. The pre-lab portion includes the Title, Objective, a complete Table of Reagents, a Balanced Chemical Equation, Pre-lab Calculations (i.e.; moles of each starting material and the Theoretical Yield), and an Outline. The Theoretical yield calculation must indicate the expected amount of product in grams for a solid product or milliliters for a liquid product.

The remaining portions of the lab notebook are filled out as the experimental work is completed. When the experiment is over, each student must submit the duplicate pages from their lab notebooks by the due date posted on Sakai. The lab notebook pages will be initialed by the Instructor/TA and stored for use by the student during the in-class exams. Only materials pertaining to the current experiment can be submitted.

In-Class Pre-lab Quizzes: Each experiment will begin with a brief quiz that consists of three questions. Pre-lab quizzes will be open notebook but closed handout/book. The first quiz question will be drawn directly from the Table of Reagents. The second quiz question will be a detail-oriented fact about the procedure and/or safety (e.g.; how much starting material, how long is the reflux, what piece of glassware, etc.). The third quiz question will be about the theoretical yield calculation. Quizzes will end after 10 minutes or when everyone who was present when the quiz began is finished, whichever is shorter. Students who arrive late will not be given extra time. Students who require accommodations must complete the quiz in the SSWD office before class begins. Since completing the quiz should be a matter of simply copying answers from a properly-prepared notebook, calculators or any other resources may not be used during the quiz.

Products: At the end of each experiment and before leaving lab, each student must report the experimental results and show the final product to the Teaching Assistant. Failure to do so will result in the loss of the Product points. The quantity and quality of your product will be evaluated. Product point deductions will also be made for safety violations, late arrival, not participating in lab, not finishing the experiment, etc.

Exercises on Sakai: Short questions pertaining to the experiments are posted on Sakai. There are both pre-lab and post-lab questions. These are study aids and do not count for points.

Technique and Safety: Success in lab goes beyond what appears on paper. Attention to safety, housekeeping, level of preparation, ability to work with others, ability to follow directions, and ability to work independently are also important. Therefore, there will be point deductions for a variety of things that impact laboratory safety and the quality of the laboratory results generated. These items include— but are not limited to— touching door handles with gloved hands, returning unused reagents to stock bottles, having exposed skin below the waist (especially ankles and tops of the feet), placing items in one's mouth in lab (e.g.; eating, drinking, chewing gum, etc.), leaving reactions unattended, removing one's eye protection, handling one's phone with gloved hands, etc.

Lab Drawers: The lab should be left in a good condition at the end of the period. Notebook pages will not be accepted until the lab has been cleaned and inspected. The TA or Instructor may also deduct Product points if the drawer or other areas of the lab—such as balances, sinks, etc.—are not left in a satisfactory condition at the end of the lab period. Items that are missing or broken from the drawer should be immediately replaced at the stockroom. There is no charge for breakage. All glassware and equipment should be cleaned and returned by the end of the lab period. Unannounced drawer inspections may occur periodically throughout the semester and technique points may be deducted if items from the lab bench are missing, broken or not clean. Points may also be deducted if extra items are found in the drawer that were not on the check-in sheet. This includes items such as clamps, tubing, thermometers, vacuum adapters, etc.

In-Class Exams: The first exam covers the first four experiments. The second exam will cover the next five experiments. Be sure to bring a No. 2 pencil and your Student ID with you to exams. The quizzes will include material covered in class, the background readings, as well as co-requisite and pre-requisite material. Points will be deducted for not following instructions. During exams, each student will be provided with a simple calculator, a periodic table, and the notebook pages submitted at the end of each experiment.

Spectroscopy Unknown: Determining the structures of organic compounds using spectroscopy is a key component of laboratory work in organic chemistry. In this exercise, each student will acquire an IR spectrum and two NMR spectra (one C13 and one proton) of an unknown organic compound. Using this data, each student will determine the identity of the unknown and assign the relevant peaks in each spectrum. Copies of the spectra obtained, as well as interpretation of the peaks, must be submitted in print by the due date posted on Sakai.

Re-grades: All requests to have items re-graded must be submitted in writing within one week after the graded materials are returned to the student.

Attendance: Students are expected to attend every lab session. Due to safety constraints and size limitations, no one will be allowed to make up an experiment in another section. Missing a lab period will result in a zero for the In-Class Quiz, the Product points and the Notebook score for that experiment. However, there is one drop in each category. Zeroes from a second missed experiment will count. Missing more than 2 experiments will result in automatic failure of the course. Notebook pages for the missed experiment may be submitted based on a classmate's work or on a video version of the experiment from the instructor.

There will be an attendance sheet that students are required to sign upon entering the lab. It is critical that the attendance sheet exactly match who is present in the lab in the event of an emergency. If a student must leave the lab after signing in (e.g.; to use the restroom, get a drink of water, etc.), the exit should be logged on the attendance sheet. For safety's sake, in order to better results and to be fair to your lab partner, time out of the lab should be limited. Students who leave the lab for a period longer than 10 minutes will receive a deduction from the Product points for that experiment. Additionally, each student must be signed in prior to the start of the in-class pre-lab quiz to ensure everyone's on-time arrival to class. Tardiness or just not signing in will result in a point deduction for that experiment.

Safety Rules: All students must read the safety rules carefully and follow them throughout the course. Anyone who does not adhere to the safety rules will receive Product point deductions and may not be allowed to remain in the laboratory. A pair of safety goggles will be provided at the beginning of the course. These and a lab coat must be worn for every class, as well as appropriate clothing and footwear.

Academic Integrity: Each student is expected to do original work. Although the lab is constructed so students may work in pairs during an experiment, all work submitted for a grade must be an individual effort. The penalty for academic dishonesty is a grade of 'F' for the course.

Late Policy: Unless otherwise specified, materials that are submitted late but on the same day as they were due will receive a 10% deduction. There will be an additional 25% deduction for each day or portion of a day, including weekends, they are late after that.

Course/Instructor Evaluation – IDEA: Loyola has the IDEA program for instructor and course evaluations. At the end of the semester, an online evaluation of this course will be completed based on criteria set by IDEA and by the instructor. For this course, the main objective is learning to apply course material. In particular, our objectives are to characterize organic compounds by measuring their physical properties, isolate organic compounds using a variety of purification techniques and, lastly, to synthesize organic compounds using chemical reactions. Keep these objectives in mind throughout the course.

Co-Requisite Chem 224 Lecture Course: The following statement came from the chemistry department office regarding dropping lecture but staying in lab, "Students wanting to drop lecture after midterm may stay in the co-req lab only if lecture midterm grade, posted in LOCUS, is a D or better. Students should continue to attend the lecture until the week of the drop date to gain as much background knowledge as possible. For Spring 2018 students wishing to drop lecture, and have a mid-term grade of D or better (in lecture), can seek assistance from the Department of Chemistry & Biochemistry office beginning Tuesday March 20 at 9:00am through Monday March 26th at 4:00pm. Students with a midterm grade of F must drop the co-req lab along with the lecture. No exceptions."

Email: A Loyola email address must be used when contacting the TAs or the instructor for this course. Emails from outside sources are often blocked automatically. In the subject line of your email, put Chem 226- section number and TAs name.

Interactions with TAs: In order to increase the amount of individual assistance each student receives in lab, Teaching Assistants will participate in delivering this course. If at any time during the semester, any questions or concerns arise about the behavior of the Teaching Assistant, please contact the Instructor.

Contacts: Dr. Eisenberg, FH-104, (773) 508-8714, jeisenberg2@luc.edu
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Experiments

1. Sodium Borohydride Reduction of Benzophenone
2. Potassium Permanganate Oxidation of Benzyl Alcohol
3. Diels-Alder Reaction of Conjugated Dienes
4. Nitration of *N*-Acetyl-*p*-Toluidine
5. Ketone Derivative Formation
6. Aldol Condensation
7. Fischer Esterification
8. Acylation of an Aromatic Amine
9. Polymers