

Description: CHEM 226 is the second semester of organic chemistry laboratory. In this course, students learn how to run organic chemical reactions and how to isolate and characterize organic compounds.

Pre-requisites: Grade of 'C-' or better in (CHEM 223 and CHEM 225) or CHEM 221.

Required Items: **Bound Composition Notebook**

Your notebook should be something basic (<\$2). It DOES NOT have to have duplicate pages, but it must be permanently bound—no spiral notebooks. I like quad-ruled to facilitate making graphs, but composition books that are college-ruled, wide-ruled, or blank pages will also work for this course.

In addition, since this is an online-only course, a desktop or laptop computer with high-speed Internet access is required. Some of the virtual lab simulations used in this course DO NOT WORK on tablets or mobile devices. Wired (ethernet cable) internet is preferred, but WI-FI is acceptable if the connection is reliable. If you do not have a desktop/laptop computer or Internet service, you need to contact Loyola ITS for information on their [equipment loan program](#) before or within the first few days of the start of the course and arrange for these resources. The lab instructor is not responsible for coordinating this for students.

Course Homepage: Announcements, assessments, videos, the grade book, etc. are posted on the course site at [Sakai.luc.edu](http://Sakai.luc.edu). For this course, all materials and due dates will be posted under the "Lessons" tab. Students should familiarize themselves with the layout of the course Sakai page and check it frequently.

Schedule: This course is set up to run online and asynchronously, but students will be able to reach the instructor and the TAs throughout the course via email. There will also be optional "live-help" sessions open to all students via Zoom at multiple times during the week. The times for these will be posted on Sakai. The course will follow a weekly schedule, and the course materials will be posted under the "Lessons" tab on Sakai. Students are expected to read through the uploaded files, watch the posted videos, and work their way through the assignments at their own pace throughout the week. **Typically, assignments will be due weekly on Mondays at 8:00 AM.** Exceptions to this are noted on Sakai and include the hard deadline on the last Friday at the end of the term. Note: all times indicated for this course are Central Daylight Savings Time.

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Email: Faculty email addresses are posted on the open Internet for every software bot and spammer in the world to see. Therefore, faculty Outlook accounts are configured differently from students. Emails from outside sources are often blocked automatically and sent to the junk folder. Because of this and a Federal law relating to student privacy (FERPA), students must use a Loyola email address when contacting the instructor or TAs about this course. In the subject line of an email, please indicate your 226 section number.

Role of the TAs: Teaching Assistants are assigned to lab sections to aid the instructor in giving help and feedback to the students in the course. The TAs' primary responsibilities include answering student questions and grading certain assignments. Students should primarily email questions to the instructor and/or the TA assigned to section for which they are registered but should feel free to attend Zoom sessions for anyone since all course sections are set up following the same guidelines. If at any time during the semester, questions or concerns arise about the behavior of a TA, please contact the instructor.

Grading: Lab grades will use the following scale and consist of the following components:

A>93%, A->90%, B+>87%, B>83%, B->80%, C+>77%, C>73%, C->70, D+>67%, D≥60%, F<60%

Knowledge Checks	15%
Labster Simulations	10%
Unknowns	10%
Pre-lab Questions	10%
Lab Notebook	20%
Post-lab Questions	20%
Formal Lab Report	<u>15%</u>
	100% total

Knowledge Checks: To explain and demonstrate various organic chemistry lab techniques in an online-only lab, much of the content is contained in videos that are posted on Sakai. Some of the videos and presentations were prepared by the course instructors and show the use of equipment and materials in Loyola's organic chemistry lab space. Other videos are from the Journal of Visualized Experiments ([JoVE](#)), a peer-reviewed scientific video journal that shows the experiments being performed in laboratories at research institutions around the world. After watching the provided video(s) on a given topic, students are asked to answer the questions in a corresponding Knowledge Check to demonstrate their understanding of the techniques. **These assignments allow unlimited submissions and no time limit up until the due date; the highest score will be recorded in the Sakai Gradebook.** Students with no submission attempt before the due date will be allowed only one late submission up until the hard deadline. Assessments must be submitted to count. Spelling, grammar, and significant figures apply to receive full credit.

Labster Simulations: [Labster](#) is another way to give students exposure to laboratory procedures that also includes the ability to manipulate a variety of experiments in a virtual space. Students should complete the different Labster simulations during the weeks that will be noted in the "Lessons" tab on Sakai. The links to the actual simulations are located on Sakai under the "Labster" tab. Points will be awarded as students work through the simulations by answering quiz questions and completing simulated lab tasks. Student progress is saved after certain stages of the simulations, allowing students to stop working and resume later if so chosen. The score from a student's "best completed attempt" at a simulation (i.e., the highest score for a simulation at 100% completion) will be entered into the Sakai Gradebook. There are recommended due dates for Labster, but all the simulations will remain open and available to students to complete for the duration of the course and may be repeated as often as desired. **Labster will turn off at 5:00 PM on Friday, August 13, and no scores will be accepted after this.**

Unknowns: One important part of laboratory work in organic chemistry is determining the identities and structures of organic compounds. There are a variety of ways to accomplish this. To gain practice with some of these techniques, students will be asked to complete some unknowns via Sakai. **These assignments allow unlimited submissions and no time limit up until the due date; the highest score will be recorded in the Sakai Gradebook.** Students with no submission attempt before the due date will be allowed only one late submission up until the hard deadline. Assessments must be submitted to count.

Pre-lab Exercises: Success in organic lab depends on advance preparation. Although this course is online-only, you may still go on to take additional chemistry labs in person later. Therefore, we are still going to practice getting ready for lab as if we are really going to perform the experiments. One major component of the pre-lab assignment is to thoroughly read and understand the written experimental procedure posted on Sakai. Additionally, students must watch the Safety and Setup video posted on Sakai before the video of the experiment being performed becomes available. There are questions embedded into each video that count as the pre-lab exercises for that experiment.

Lab Notebooks: The ability to keep good records is a valuable, widely applicable skill. While you may never run a chemical reaction after this class, chances are good that you will be asked to keep good records no matter what your eventual profession. To practice this useful skill, students are required to keep a laboratory notebook. A properly maintained notebook will make understanding a lab experiment easier and keep experimental results all in one place. There are some videos and a handout posted on Sakai that review the content and format of a lab notebook for organic chemistry experiments.

One of the most important facets of laboratory work is that experiments should be recorded as completely and accurately as possible. So, students should write notebook entries with enough detail that someone else could recreate the experiment exactly. This means that the lab notebook entries should accurately reflect everything that happened during the experiment. Sometimes, important discoveries are made when things do not behave as expected. Therefore, it is critical that students report their actual observations and not what they think the correct answer should be.

For this course, student notebook pages will be based on two selected virtual labs—esterification and Diels-Alder. The pre-lab portions will be scanned and submitted via Sakai as files in the pdf format. Once the pre-lab is submitted, the video of the experiment being performed will become available. At the end of the term, students will also make a short video in which they demonstrate that their notebook contains all the required parts as listed in the handout on Sakai (e.g., permanent binding, numbered pages, table of contents, etc.) The procedure, results, and discussion sections for the esterification lab will form the basis of the formal lab report. You also must have procedure, results, and discussion sections for the Diels-Alder experiment in your video.

Post-lab Exercises: Short questions pertaining to the some of the experiments will be posted on Sakai. These should be completed after watching the video of the experiment being performed. **These assignments allow unlimited submissions and no time limit up until the due date; the highest score will be recorded in the Sakai Gradebook.** Students with no submission attempt before the due date will be allowed only one late submission up until the hard deadline. Assessments must be submitted to count.

Formal Lab Report: A formal, type-written lab report over the Esterification experiment will be due by the 8 AM on Monday, July 19, 2021. This report should be clearly written using proper scientific grammar (do not use first person tense like “I did this” or “we saw this”). More detailed guidelines for the report will be posted on Sakai. The lab report must be submitted as a pdf file.

Late Policies and Hard Deadline: See the notes for each type of assignment for the policies regarding due dates and late assignment submissions. **Any remaining assignments and late work that was not already due must be submitted by the end of the course at 5:00pm on August 13, 2021.** Final grades will be calculated based on materials submitted by this hard deadline. If there are substantial materials that are missing and that cannot be submitted before this deadline, the student should request an Incomplete.

Academic Integrity: All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at: <http://www.luc.edu/cas/advising/academicintegritystatement/> A basic mission of a university is to search for and to communicate the truth as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty. Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student’s work, and submitting false documents. Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to the Chair of the Department of Chemistry & Biochemistry, who will decide what the next steps may be. The penalty for academic dishonesty is a zero on the assignment and a possible letter grade reduction of the final course grade.

Copyright/Privacy Statements: Course content is designed for use ONLY by students in this course. All materials are subject to privacy and copyright laws. Students are NOT allowed to share any course resources (Labster info, Panopto videos, PowerPoints, quiz/test/exam questions, documents, etc.) with anyone not registered for the course, nor are students allowed to upload, post, copy, share them to any outside media sites without explicit permission from the instructor. If discovered that a student completes such action, the Chair of the Chemistry & Biochemistry Department will be notified immediately.

Course/Instructor Evaluation – SmartEval: The following information came from the University regarding course evaluations:

*“Towards the end of the course, the students will receive an email from the Office of Institutional Effectiveness reminding them to provide feedback on the course. They will receive consistent reminders throughout the period when the evaluation is open, and the reminders will stop once they have completed the evaluation.*

*-The evaluation is completely anonymous. When the results are released, instructors and departments will not be able to tell which student provided the individual feedback.*

*-Because it is anonymous and the results are not released to faculty or departments until after grades have been submitted, the feedback will not impact a student’s grade.*

*-The feedback is important so that the instructor can gain insight into how to improve their teaching and the department can learn how best to shape the curriculum.”*

Course Repeat Rule: Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: <http://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

Student Accommodations: Loyola provides services for students who need accommodations. Any student who would like to use any of these university services should contact the Student Accessibility Center (SAC), Sullivan Center, (773) 508-3700. Further information is available at <http://www.luc.edu/sac/>.

Topics Covered: (Note: the final schedule will be noted on Sakai.)

1. Proper Lab Notebook Keeping and Stoichiometry
2. NMR Spectroscopy: 1D  $^1\text{H}$  and  $^{13}\text{C}$ , DEPT, 2D, and Heteronuclear NMR
3. Polarimetry and Introduction to Mass Spectrometry
4. Fischer Esterification of Isopentyl Alcohol and Acetic Acid
5. UV-Vis Spectroscopy of Conjugated Organic Systems and Diels-Alder Reaction of Anthracene and Maleic Anhydride
6. Organic Redox Reactions: Potassium Permanganate Oxidation of Benzyl Alcohol and Sodium Borohydride Reduction of Benzophenone
7. Anhydrous Reagents and Organometallic Reagents: Grignard Reaction
8. Organic Macromolecules: Swelling Capacity of Crosslinked Polyacrylate and Condensation Synthesis of Nylon
9. Advanced Laboratory Safety

#### Labster Simulations

1. Proton NMR: Spectrum Interpretation
2. Nuclear Magnetic Resonance (NMR): Analyze small protein samples
3. Nucleophilic Addition: Explore the Grignard Reaction