

Description: CHEM 242 is the third course in the chemistry laboratory sequence and is designed to teach Chemistry and Biochemistry majors how to plan and perform chemical synthesis reactions and to evaluate and report the results.

Course Objectives:

1. Utilize best practices for working safely in lab
2. Synthesize, purify, and characterize chemical compounds
3. Search the chemistry literature for existing synthesis laboratory procedures
4. Render a published procedure into an executable laboratory experiment
5. Present the results with a written report and an oral presentation
6. Perform laboratory work in a research environment

Meeting Times and Locations: All sections of CHEM 242 meet in LSB 115.

Section	Day/Time	Instructor	Teaching Assistants
001	Mondays & Wednesdays 11:30 AM – 2:15 PM	Mr. Thomas	Jordan MacQueen
002	Tuesdays & Thursdays 11:30 AM – 2:15 PM	Dr. Eisenberg	Mitch Meves & Katie Siver

Academic Calendar: It is the student's responsibility to know both the schedule for this course (posted above) as well as the University's official [Academic Calendar](#). Students are responsible for attending class for the duration of the term.

Office Hours: Office hours for the instructor and TAs are posted on Sakai.

Pre-requisites: Grade of 'C-' or better in CHEM 180 and CHEM 181.

Required Materials:

1. Bound composition notebook (not spiral bound and with no tear-out perforations).
2. Access to Microsoft 365. This is provided by Loyola to students.
3. Safety goggles (We provide a pair to you on the first day). If you wish to get your own, they must be Type G, H, or K goggles and must meet the requirements of ANSI Z87.1.
4. Long-sleeved, full-length laboratory coat.
5. Appropriate clothing and footwear as described in the laboratory safety rules.
6. A non-erasable, waterproof pen.
7. Access to Sakai.

This course utilizes materials that require a device with high-speed internet access. Wired (ethernet cable) internet is preferred, but WI-FI is acceptable if the connection is reliable. Students are responsible for having access to a suitable device and the internet access necessary for submitting all online assignments by the posted due dates. If you do not have a desktop/laptop computer or Internet service, go to the Information Commons or contact ITS for information on their loan equipment program within the first few days of the start of the course and arrange for them.

Course Homepage: All course materials are posted on [Sakai.luc.edu](#). Students should check the Sakai site for this course frequently as it is central to how the lab operates. **Please note that all course materials should be accessed under the Lessons tab** where details are broken down by topic/experiment. Certain assignments may not open properly if attempts are made to access them through other tabs.

Grading: The course grade consists of the following components:

- |  |     |
|--|-----|
| 1. Pre-lab Notebook Preparation              | 20% |
| 2. Lab Results/Notebook Entries              | 20% |
| 3. Lab Safety Points                         | 10% |
| 4. Synthesis Proposal                        | 10% |
| 5. Synthesis Project Performance and Records | 25% |

## 6. Synthesis Report and Presentation

15%  
100% total

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

Lab Safety Rules: Working safely in the laboratory is something that everyone must always consider. Before working in lab, all students will be expected to have watched the safety videos and read the lab safety rules, both of which are posted on Sakai. Students MUST follow these rules throughout the course. On lab safety day, students must sign a Lab Safety Contract that acknowledges that the student received the safety rules and agrees to follow them. A lab safety contract must be signed by a student before they are allowed to work in the lab. Anyone who does not adhere to the safety rules will receive point deductions and may not be allowed to remain in the laboratory, depending on the severity of the violation. Students must bring eye protection and a full-length lab coat to every experiment. Students must also dress in appropriate clothing and footwear such that there is no exposed skin at any point below the shoulders. For the sake of hygiene and other reasons, students may not borrow goggles and/or a lab coat. Any student who comes to lab without these items will automatically not be allowed to perform the experiment. More information on the course attendance policy and safety points can be found below.

**\*\*\* WHENEVER CHEMICALS ARE PRESENT, NO ONE MAY ENTER LSB-115 UNLESS THEY ARE WEARING THE FOLLOWING: \*\*\***

1. **EYE PROTECTION (These must be Type G, H or K goggles and must meet or exceed ANSI Z87.1)**
2. **FULL-LENGTH LAB COAT**
3. **CLOSED-TOE, CLOSED-HEEL SHOES**
4. **APPROPRIATE ATTIRE THAT FULLY COVERS ALL SKIN BELOW THE WAIST**

Attendance: This course will be broken into roughly two halves. For the first part of the semester, students are expected to be prepared for every lab session and complete the defined experimental lab work during the allotted class time. Due to safety constraints, time, and size limitations, students are not allowed to make up an experiment in another section. However, because students will be working independently in this class, any student absent from lab will be responsible for completing the missed lab work when they return. Students must inform the instructor via email within 24 hours of the absence so required chemicals will remain available to them and assignment deadlines can be adjusted on Sakai if needed. Due to the large emphasis on attendance-based work, if a student is absent for more than 3 lab periods, they must also contact the instructor to evaluate if remaining in the course is feasible.

For the second part of the course, students will be working on independent projects. It is the student's responsibility to plan out their experiments to ensure that lab work is completed during the allotted lab time. LSB 115 is used for many other lab sections throughout the week (including immediately following these section times), so no one should plan to perform work in the lab outside of the normal class time. If outside work is unavoidable, it must be minimal. Students MUST have the instructor's approval and supervision arrangements in place before the lab work is started.

Students are required to check in with their TA and sign an attendance sheet before entering the lab. It is critical that the attendance sheet exactly matches who is present in the lab in the event of an emergency. If someone must leave the lab after signing in (e.g., to use the restroom, get a drink of water, etc.) that person must be sure to talk to their TA and/or log out on the attendance sheet. For safety's sake and to obtain better results, students should limit their time out of the lab. Students who leave the lab for a period longer than 10 minutes will receive a deduction from the Lab Safety points. Additionally, due to time constraints and to ensure fairness to everyone, **students must arrive within 15 minutes of the start time for lab to complete the experiment; any student arriving more than 15 minutes late will be marked absent.**

**Lastly, as previously mentioned, any student who does not have safety goggles or lab coat, is not dressed appropriately, or has not completed the required pre-lab preparation will not be allowed to work in the lab that day and will be marked absent.**

Pre-Lab Preparation: Success in lab depends on advance preparation. Students who come to class prepared get better results, get done faster, and, most importantly, tend to have fewer accidents. Therefore, there are several things that students must do BEFORE coming to the lab. One major component of the pre-lab assignment is to thoroughly examine the materials posted about the experiment on Sakai. Before coming to class, students must also complete the pre-lab portion of their notebooks. The lab notebook format is posted on Sakai and will be discussed on the first day of class. For the first half of the course, each student must scan and upload the pre-lab portion of their notebook to be eligible to participate in that experiment in lab. To allow time for the pre-labs to be checked, the due date for uploading the notebook pages will be 30 minutes before class begins. **No pre-labs will be accepted less than 30 minutes before class, and students who don't complete the pre-lab portion of the notebook will not be allowed to perform the experiment.**

For the second half of the course, students must show their pre-lab preparation to their TA and/or instructor to be initialed before any experimental work begins that day. This will help to ensure that everyone is aware of what experimental work will be performed that day and that the steps outlined can be done in the time allotted.

Lab Results/Notebook Entries: The ability to keep good records is a valuable skill. A properly maintained notebook will make an experiment easier and helps to keep experimental results all in one place. One of the most important facets of experimental work is that data should be recorded as completely and accurately as possible. Sometimes, important discoveries are made when things don't go exactly as expected. Therefore, it is critical that students report their actual data and not what it is thought that the correct answer should be. Procedures should be written entirely in past tense to document the experiment as it was actually performed. **THE NOTEBOOK MUST ACCURATELY REFLECT WHAT HAPPENED DURING THE EXPERIMENT.** Lab notebook entries are not meant to be written as instructions for others, but as a written record of what happened while performing the experiment.

Notebook entries completed DURING LAB should include a **detailed procedure section written while the experiment is being performed** and a summary of the experimental results (usually as a table). The material normally covered in the discussion or conclusion section of the notebook will be included in the Lab Reports, where applicable. Therefore, the discussion/conclusion section does not have to be included in the lab notebook for this class.

For the first half of the course, after a lab is completed, the pages will then be scanned and uploaded to Sakai to maintain a digital record of the work as well as for grading purposes. **Notebook entries are due at the end of every lab period.** To receive credit, the upload must be submitted as a single file in the PDF format, and the contents must be legible and oriented correctly. No notebook pages can be submitted via email. If an experiment runs long enough to prevent notebook pages from being scanned by the end of class, the due date may be extended on a case-by-case basis as necessary.

During the second half of the course, notebook entries should be written every time experimental work is performed following the established notebook format. Notebook entries will be routinely checked at the end of the lab period for completion. At the end of the semester, a more detailed evaluation of all lab notebook entries covering the independent project will be conducted to more closely examine the details of the lab work performed. Points will be awarded for the daily completion of notebook entries as well as for the overall evaluation and will count towards the Synthesis Project Performance and Records portion of the grade.

Lab Safety Points: Laboratory safety is an extremely serious and important topic. All violations of the safety rules will result in point deductions. Some safety violations may also result in the student being expelled from the lab. As employees, the instructors and Teaching Assistants are expected to enforce the safety rules and disciplinary actions may be taken against them by Loyola if the safety rules are not enforced. Therefore, please do not ask the instructors or Teaching Assistants to ignore any safety rules or to not apply any penalties for safety infractions. They are not optional. Some examples of safety violations that result in immediate point deductions include things like removing safety goggles in the lab, touching your phone with your gloved hands, eating or drinking in lab, etc. These are just some examples—the list is not all-inclusive because it is impossible to foresee every potential safety violation. Some examples of safety violations that will result in immediate expulsion from the laboratory include things like wearing inappropriate attire, dumping chemical waste down the sink, etc. Again, these are just some examples. There are other safety violations that could

come up that may result in a student being asked to leave the lab. In addition, incurring multiple lesser safety violations may also result in a student being asked to leave the lab, even if the infractions wouldn't warrant expulsion individually. Each experiment will have three safety points at stake.

Synthesis Proposal: A major component of this course will be for students to explore the chemical literature for published synthetic procedures, choose a two-step synthetic procedure, revise it as needed, and perform the experimental steps and analysis for the synthesis in the laboratory. Students will have to evaluate their various resources (time, equipment, cost, etc.) and gain laboratory work experience in a research environment.

Synthesis Project Report and Presentation: At the end of the semester, students are expected to write a formal lab report summarizing the results of their independent projects. The purpose of the lab report is to formalize one's experiment with written documentation that is accurate and understandable to others. Students will combine and elaborate on the experimental information from the pre-lab materials and their lab notebook entries to compose a type-written report that conveys the results and importance of the experiment. Reports must be submitted as a single PDF file using the assignment link posted on Sakai. Students will also give a BRIEF presentation to explain their projects and results to the class.

Re-grades: All requests to have any submitted assignment re-graded must be submitted in writing within one week after the graded materials are returned to the student. Students should email the instructor to question the specific portion(s) of their assignment that they feel was scored incorrectly for a re-grade, not the TA.

Late Policy: Unless otherwise specified above, assignments may be submitted late. Assignments submitted late but within the same week as they were due will receive an automatic 25% deduction. Late submissions will be accepted until the course hard deadline but will receive a 50% deduction.

Hard Deadline: All materials of any kind must be submitted by 5 PM on Friday, December 8, 2023. No materials will be accepted after this time. Final grades will be calculated based only on materials submitted by this deadline. If there are substantial materials that are missing and that cannot be submitted before this deadline, the student should consider withdrawing from the course or requesting an Incomplete by completing [this form](#) prior to the end of the term.

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, and an outside contractor also scans faculty email. Emails from outside sources are often blocked automatically. Because of this and a Federal law relating to student privacy (FERPA), students must use a Loyola email address when contacting the TAs or the instructor about this course. In the subject line of an email, please put Chem 226-section number and TA's name.

Interactions with TAs: To increase the amount of individual assistance students receive in lab, Teaching Assistants will participate in delivering this course. If at any time during the semester you have any questions or concerns about the behavior of your Teaching Assistant, please contact the instructor.

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."*

Regarding the use of Artificial Intelligence: our Provost has expressed to "Let us all make sure we are learning and sharing best practices and not allowing AI to do the learning for us." In this course, any work you submit for credit must represent your own ideas and understanding of the assigned material. If you are uncertain



about any case where your use of AI may be in conflict with University or course standards, please see your instructor to discuss your concerns.

Any instance of dishonesty (including those detailed on the website provided above) will be reported to The Chair of The Department of Chemistry & Biochemistry, who will decide what the next steps may be. The penalty may include a grade of zero for that assignment and/or failure of the course.

Health, Safety, and Well-Being On-Campus: Please be familiar with and adhere to all current policies and protocols posted on the Campus Info & Resources site:

<https://www.luc.edu/healthsafetyandwellbeing/campusinforesources/>

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). The Department advises that it is preferable to complete a course with a grade of C or C-, and to demonstrate growth in future coursework, rather than to withdraw from a course.

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: <https://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 University Chicago provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with the Student Accessibility Center (SAC). Professors will receive an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to audio record class lectures in order to provide equitable access to students with disabilities. Students approved for this accommodation use recordings for their personal study only and recordings may not be shared with other people or used in any way against the faculty member, other lecturers, or students whose classroom comments are recorded as part of the class activity. Recordings are deleted at the end of the semester. For more information about registering with SAC or questions about accommodations, please contact SAC at 773-508-3700 or [SAC@luc.edu](mailto:SAC@luc.edu).

Loyola University Absence Policy for Students in Co-Curricular Activities (including ROTC): Students missing classes while representing Loyola University Chicago in an official capacity (e.g., intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes.

Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation i.e., [“Athletic Competition & Travel Letter”](#) describing the reason for and date of the absence.

This documentation must be signed by an appropriate faculty or staff member and it must be provided to the professor in the first week of a semester. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to allow the student to take the examination at another time. (<https://www.luc.edu/athleteadvising/attendance.shtml>)

Students who will miss class for an academic competition or conference must provide proper documentation to their instructor as early in the semester as possible.

**Accommodations for Religious Reasons:** If you have observances of religious holidays that will cause you to miss class or otherwise effect your performance in the class you must alert the instructor **within 10 calendar days of the first class meeting of the semester** to request special accommodations, which will be handled on a case-by-case basis.

**Privacy Statement:** Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use. Additionally, all materials from this course cannot be shared outside the course without the instructor's written permission.

**Instructor Contacts:** Mr. Thomas, LSB-124, (773) 508-8115, [tthoma1@luc.edu](mailto:tthoma1@luc.edu)  
Dr. Eisenberg, LSB-124, (773) 508-8714, [jeisenberg2@luc.edu](mailto:jeisenberg2@luc.edu)

**Topics Covered Include:**

1. Lab Safety
2. Control of Reaction Temperature
3. Synthetic Polymers and Biopolymers
4. Monitoring a Reaction with TLC (Sodium Borohydride Reduction)
5. Monitoring and Purifying a Reaction (Acetylation of Ferrocene)
6. Combinatorial Chemistry to Form Unknown Esters
7. NMR Spectroscopy
8. Manipulating Chemical Equilibria (Fischer Esterification)
9. Characterization of Unknown Aldol Reactions
10. Multi-Step Synthesis of Aspirin (Ester Hydrolysis and Acylation)
11. Independent Synthesis Projects