

Description: This course is the second in a sequence of laboratory classes designed to create foundational knowledge and proficiency in essential chemistry laboratory techniques and skills. It includes hands-on experiments designed to illustrate the relationships between the structures of compounds and their resulting properties. It is also intended to provide students with additional exposure/experience with lab safety and proper handling of chemicals. The lab will introduce and develop techniques for purifying and characterizing chemical compounds and determining their structures.

Course Objectives:

1. To establish best practices for working safely in lab—including maintaining good chemical hygiene, wearing personal protective equipment, knowing the locations of and proper use of safety showers, eye washes, fire extinguishers, etc., maintaining good ventilation, and proper waste disposal.
2. To develop information literacy skills by searching for authoritative, reliable physical property data from sources such as SciFinder Scholar, the Merck Index, PubChem, etc.
3. To develop analytical reasoning skills by determining the functional group(s) present in an unknown compound using qualitative chemical tests and IR spectroscopy.
4. To utilize experiments to demonstrate relationships between the structures of compounds and their properties, to develop laboratory techniques for measuring mass, volume, and temperature, and to gain practice in collecting, analyzing, and presenting data, including dealing with sources of error.
5. To separate mixtures using differences in chemical and physical properties and to analyze the composition of a mixture, to develop laboratory skills such as dissolving solids and preparing solutions of known concentration, to explore relationships between the structures of compounds and their partitioning behavior
6. To utilize problem-solving skills by identifying compounds and to analyze compounds by gas chromatography, mass spectrometry, and NMR spectroscopy

Academic Calendar: It is the student's responsibility to know both the schedule for this course, which is posted on Sakai, and the official [University Academic Calendar](#).

Meeting Times and Locations: All sections of CHEM 181 meet in LSB 115.

Section	Day and Time	Teaching Assistants
001	Mondays 8:30 AM – 11:15 AM	Grant Steiner
002	Mondays 11:30 AM – 2:15 PM	Grant Steiner
003	Mondays 2:45 PM – 5:30 PM	Leslie Castillo
004	Mondays 5:45 PM – 8:30 PM	Brian Aranda

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

Pre-requisites: Grade of 'C-' or better in CHEM 160 and 161.

Required Items:

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-sleeve, 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 contains some elements that require a desktop or laptop computer with high-speed Internet access. Some of the virtual lab simulations used MAY 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 will need to go to the Information Commons on campus or contact the extended loan equipment program within the first few days of the start of the course and arrange for these resources.

Course Homepage: Announcements, assessments, extra copies of the handouts, the grade book, etc. are posted on Sakai.luc.edu. Students should check Sakai frequently as it is central to how the course 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.

Safety Rules: Before working in lab, all students will be expected to have watched the safety videos, read the lab safety rules, and submitted the lab safety quiz, all 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**

Grading: Course grades consist of the following components:

Pre-lab Exercises	25%
Lab Notebook Entries and Results	25%
Lab Safety Points	10%
Post-lab Exercises	20%
Combined Spectroscopy Unknown	10%
Final Lab Notebook Evaluation	<u>10%</u>
	100% total

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

Attendance: Students are expected to attend every lab session. **Any student who does not have their safety goggles or lab coat, is not dressed appropriately, or has not completed the pre-lab preparation on time will be marked absent.** Due to safety constraints and size limitations, students are not allowed to make up an experiment in another section. Missing a lab period for any reason will result in an automatic zero for any in-class work that is not completed. The Pre-lab and Post-lab exercises can still be completed via Sakai, but the normal due dates will still apply. **Students will be allowed to complete an alternate assignment for the Notebook, Results and Safety points for ONE absence from lab during the course. Absent students are responsible for requesting it via email from the instructor within 48 hours of the absence.** Any additional missed work beyond one experiment cannot be made up and will result in 0s.

There will be an attendance sheet that students are required to sign upon 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 to log out on the attendance sheet. For safety's sake, to better results and to be fair to both lab partners, students should limit time out of the lab. Students who leave the lab for a period longer than 10 minutes will receive a deduction from the Notebook Submission points for that experiment.

Additionally, to ensure fairness to everyone, students who arrive late may be asked to perform an experiment solo. **Students must arrive within 15 minutes of the start time for lab to do the experiment; any student arriving more than 15 minutes late 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 read and understand the experimental procedure that is posted on Sakai. Students must also watch any videos posted on Sakai about the experiment. Before coming to class, students must complete the pre-lab exercises posted on Sakai. Most of the Pre-lab exercises for this course are Labster simulations. Pre-lab exercises have unlimited attempts until the due date. A student must attempt every question and score a minimum of 80% of the available points on the pre-lab exercises for an experiment to be eligible to complete that experiment in lab. To allow time for completion of the pre-lab material to be checked, the due date for pre-lab exercises 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 as instructed will not be allowed to perform the experiment.

Lab Notebooks and Results: 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. For this class, the pre-lab portions of the lab notebook will be posted on Sakai, and there will be some pre-lab quiz questions about it. THIS MATERIAL DOES NOT HAVE TO BE RECOPIED INTO THE LAB NOTEBOOK. Notebook entries will be written DURING LAB and should include a title, a balanced chemical equation, a **detailed procedure section written while the experiment is being performed**, and a summary of the experimental results. The material normally covered in the discussion or conclusion section of the notebook will be included in the post-lab exercises described below, so a discussion/conclusion section does not have to be included in the scanned lab notebook entries for this class.

Note: 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 act 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 performing the experiment. 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.

Final Lab Notebook Evaluation: Notebooks will be collected at the end of the semester and compared against the scanned notebook pages submitted on Sakai. Points up to and including full credit may be deducted if the actual notebook does not match the submitted files, does not match the characteristics described in the handout posted on Sakai, such as permanently bound, written in pen, etc. Notebook point deductions may also be made for not writing in third person and passive voice, using the wrong tense, grammatical errors, spelling errors, etc.

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 three, lesser safety violations in one lab period will result in a student being asked to leave the lab, even if the infractions wouldn't warrant expulsion individually. Any student who is removed from lab for safety violations two times will automatically receive one lower letter grade. If a student is removed from lab for safety violations a third time, they will automatically fail the course. Each experiment will have three safety points at stake.

Post-lab Exercises: While performing an experiment, students are often very focused on the tasks being completed and do not always pause to consider why certain things are done in specific ways. To reinforce the concepts and techniques that were performed in lab and allow more time to think through the techniques, students will also complete post-lab exercises outside of class after each experiment. The format for the post-labs will vary depending on the experiment, so refer to the details, links, due dates, etc. on Sakai in the individual experimental Lessons folders.

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 a specific portion(s) of their assignment that they feel was scored incorrectly for a re-grade, not the TA.

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

Hard Deadline: All materials of any kind must be submitted by 5 PM on Friday, April 28, 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 225-section number and TA's name.

Interactions with TAs: To increase the amount of individual assistance you 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."

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 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, 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: The Student Accessibility Center (SAC, formerly known as SSWD), Sullivan Center (773-508-3700), <http://www.luc.edu/sac>, has the mission “to support, service, and empower Loyola University Chicago students with disabilities” and to “Partner with faculty and staff to provide opportunities for collaboration, professional development, personal growth, and staff interaction, as they relate to students with disabilities.” Please direct all questions concerning accommodations of disabilities to the Student Accessibility Center. Academic accommodations afforded to students require documentation and review. The Student Accessibility Center will issue accommodation letters for registered students to present to their instructors; accommodations are not active until students present these letters to their instructors. If students’ accommodations involve attendance or deadlines, instructors and students will jointly complete and execute an Agreement Form articulating their terms. See <https://www.luc.edu/sac/faculty/facilitatingaccommodations/> for guidance about implementing various kinds of accommodations in a way that is appropriate to your class. The Student Accessibility Center stands ready to work with you.

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 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 as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time. (<https://www.luc.edu/athletheadvising/attendance.shtml>).

Accommodations for Religious Reasons: If you have observances of religious holidays that will cause you to miss class or otherwise affect 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

Experiments

Week 1 (January 16): Martin Luther King Day

Week 2 (January 23): Chemistry Information Resources and Software, Laboratory Safety

Week 3 (January 30): Structural Representations and Molecular Modeling of Hydrocarbons

Week 4 (February 6): Functional Group Tests and IR Spectroscopy

Week 5 (February 13): Distillation

Week 6 (February 20): Recrystallization and Melting Point Determination

Week 7 (February 27): Extraction

Week 8 (March 6): **No Labs - Spring Break**

Week 9 (March 13): Thin-Layer Chromatography

Week 10 (March 20): Practical Lab Exam

Week 11 (March 27): NMR Spectroscopy

Week 12 (April 3): Natural Product Extraction and Mass Spectrometry

Week 13 (April 10): **No Labs - Easter Break**

Week 14 (April 18 – 21): Combined Spectroscopy Unknowns

Week 15 (April 25 – 28): Combined Spectroscopy Unknowns