

CHEM 160: Chemical Structure and Properties

The purpose of this syllabus is to describe the course, resources, and policies. It is meant to help all students understand the expectations and requirements for the course, and it should be used as a reference for questions about policies. When updates to the syllabus are made during the term, a new version will be posted electronically, and all students will be notified.

Course Information

Course: Chemistry 160 – Chemical Structure and Properties (3 credits: Lecture & Discussion)

Prerequisites: Math 117 with a grade of C- or better, or the equivalent. A student missing a prerequisite may be withdrawn at any time.

Time Zone: This syllabus lists dates/times using Chicago local time (U.S. Central Time Zone)

Lecture/Discussion: MWF 8:20-11:10am, Flanner Hall 007

Section Instructor: Dr. Sandra Helquist (Ph.D.)

Instructor Contact Information:

Office: Flanner Hall 200-B (shared office suite)

Email Policy: Use your Loyola (@luc.edu) email and send to shelquist@luc.edu with only “CHEM 160” in the subject line of the message, OR, reply directly to an email that I’ve sent to the class via Sakai. Doing either of these will ensure that I read your message. In most cases I will be able to respond within 24 hours Mon-Fri when classes are in session. You are encouraged to use Office Hours to get immediate answers to your questions, and to use your classmates as resources for help. You are welcome to email me in the evenings/nighttime, and you can expect a response sometime during the next day.

Office Hours Policy: *You are welcome to stop by at any time* to see if my door is open and check my posted schedule. Occasional extra hours may be announced in class. For regular OH, just show up!! Bring your questions anytime during the times listed. Bring a classmate with you or meet your classmates there to work together & get feedback & help.

Office Hours Schedule: informal, after class, stick around in the classroom!

- In the Flanner 200 office suite: Thursdays TBA
- Occasional Sunday Zoom hours: times will be updated weekly when available
- Updated times will be posted on [Sakai Resources for Help](#)

Required Course Materials

- (1) OpenStax Chemistry, Atoms First 2e. Web-only, digital, or printed version.
<https://openstax.org/details/books/chemistry-atoms-first-2e?Book%20details>
- (2) Online homework: [ALEKS](#), see [Sakai](#) for additional information and recommendations
- (3) Electronic resources, e.g., [Loyola Sakai](#) & [email](#), Gradescope
- (4) Molecular Model Kit (will be provided in class)
- (5) Scientific calculator

Copyright/Intellectual Property reminder: Course materials provided by your instructors at Loyola, including my materials, may not be shared outside any course without the instructor’s **written permission**. Content posted without permission will be in violation of Copyright/Intellectual Property laws.

Course Description

This course is the first in a sequence of multiple chemistry courses designed to create foundational knowledge and proficiency in essential chemistry concepts and skills. It includes the following topics: atomic structure, periodic properties, characteristics of bonding and properties of molecules, solid states, interactions and connections of light and matter, quantum and molecular mechanics models of atoms and molecules. Historical and current developments in chemistry as well as real-world problems that chemists address are incorporated into the course.

Alongside specific content, these themes will cycle through each of the foundational courses. They include:

- Structure-Activity Relationships
- The culture and practice of science.
- Energy.
- Polymers, proteins, and macromolecules.
- Sustainability.

- Chemical synthesis, purification, characterization, and analysis.

Learning Outcomes

The emphasis of this course is on understanding, prediction, investigation, explanation and evaluation over memorization. This means that students must foster their problem solving skills, ability to make claims based on evidence, use and understanding of models and their limitations, and skills of effective communication of scientific results. It is not enough to know *what* happens in chemistry, the student must also be able to explain *why* it happens. When successful, a student will be able to:

- Differentiate types of matter based on their chemical and physical properties (for example, pure substances vs. mixtures, metals vs. nonmetals, ionic vs. covalent vs. metallic, electrolyte vs. nonelectrolyte).
- Use multiple perspectives of matter (macroscopic, particle, symbolic levels) to qualitatively describe and explain characteristics, properties, and relationships of the following: atomic structure, periodicity, molecular structure, chemical bonding, gases, liquids and solids, solutions.
- Draw and interpret multiple representations of structures depicting connectivity, configuration, and conformations.
- Quantify relationships between variables controlling chemical systems.
- Differentiate among closely related factors, categorize problem types, and select appropriate tools to solve these problems.

Summer Session Tutoring information

The Tutoring Center is excited to offer Peer Tutoring to help students reach their academic goals this summer! Summer A services start Monday, May 22, 2023.

Expectations

I expect you to show up on time for each class and to come prepared, having kept up with the material by working homework, reading in the textbook and accessing resources for help. Furthermore, I expect you to take ownership of your learning and to use class and office hours to learn the material by engaging with classmates and asking questions. You will need to contact a classmate for notes, topics, sections, covered if you miss a class. Make-up assignments are not available in this course. Be courteous: save electronic messaging for after class. Plan your schedule so you have at least 25 hours per week outside of class for reading, working problems, asking questions, i.e, studying (learning) the material on a Daily Basis. You may require up to 40 hours per week depending on prior preparation for this course. Make time (hours) for this course every day: do not count on cramming on weekends or just before quizzes and exams as you will be much less likely to master the course objectives. What can you expect of me? My primary objectives are to provide you with the tools, environment, encouragement, and support to learn Chemistry. Because the course objectives are based on what students will learn, my teaching techniques include the use of pre-lecture homework, active learning and metacognition, to help you maximize your learning. I expect that all of us will work together!

Classroom & Group Work Guidelines

The classroom is a space designed for learning. My expectations are that all voices will be heard and appreciated in the classroom, and that we will invite each other to engage while recognizing that contributions can take multiple forms.

Student Accommodations

Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Professors receive the accommodation notification from SAC via Accommodate. 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 record class lectures in order to provide equal 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. *If you use the Testing Center, please schedule all of the tests*

for this class at the beginning of the term. If a scheduled test date changes, you will still be accommodated if you had scheduled your test in advance.

Course Repeat Rule

Students are allowed only THREE attempts to pass a particular chemistry course with a C- or better grade. The three attempts include withdrawals (W). The Department advises 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.

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:

<https://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. Evidence of cheating in this course will result in, at a minimum, a score of zero (which cannot be dropped from grade calculations) and penalty up to failure of the course. College policies include that instructors will report incidents of academic misconduct to their chairperson as well as to the Assistant Dean for Student Academic Affairs in the CAS Dean's Office. I will report incidents to the Chemistry & Biochemistry Department for further action(s).

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. (<https://www.luc.edu/athleteadvising/attendance.shtml>)

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.

Students who will miss class for an academic competition or conference must provide proper documentation to their instructor as early in the term 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 4 calendar days of the first class meeting of the term** to request special accommodations, which will be handled on a case by case basis.

Class Recording & Content Information

In general lecture, class sessions may be recorded. The following is a mandatory statement for all courses in the College of Arts & Sciences (CAS). We will discuss class norms and standards during the first week and continue the discussion as needed throughout the semester.

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.

Additional Content, Copyright & Intellectual Property Statement

By default, students may not share any course content outside the class without the informed written consent of the owner of that content. This includes any additional recordings posted by students, materials provided by the instructor, and publisher-provided materials. For example, lectures, quiz/exam questions, book figures/slides, and videos may not be shared online outside the class. In some cases, copyright/IP violations may overlap with breaches of academic integrity. Remember that obtaining consent to share materials is an active process.

Pass/Fail Conversion Deadlines and Audit Policy

A student may request to convert a course into or out of the "Pass/No-Pass" or "Audit" status only within the first two weeks of the semester. For the Summer 2023 Session A, students are able to convert a class to "Pass/No-Pass" or "Audit" through Friday, May 26th. Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

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/>

Final Exam

The final exam for the course is given on the last day of the Summer Session A term: Friday June 30th. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either. Components of the cumulative and comprehensive CHEM 160 final exam will be common across all course sections by consultation among all Section Instructors and the Course Coordinator.

Universal Absence Accommodation Policy

The purpose of a universal absence accommodation policy is to account for emergency circumstances (e.g., serious illness, caring for a family member, car accident) that require you to be absent from class, while maintaining fairness in grading for students who attend and complete all in-class graded assignments. We believe that class attendance and participation are essential for your success in this class, and that your health is important to us and our shared community. Please use good judgement and stay home if necessary/prudent for your circumstances.

This is the universal accommodation policy for in-class graded assignments:

- Group Work: the specification for an A is 90% to allow for missed work.
- FOs: multiple attempts at Mastery are automatically provided during the term.
- COs: you are eligible to submit for Proficiency after the first attempt at an CO whether you complete the problems or not; reattempts at Mastery are available during the term.
- Free-response Tests: a missed in-class test due to absence for any reason is already accommodated in the course grading system. Given that only the higher scores on these tests are included in this calculation, a missed test would be the one not included in this calculation, as it would be the lowest score (0%) of the tests.

You may provide documentation for an absence, but it is not required. These accommodations are automatically available to all students.

Course Topics

We will not cover every topic in every chapter of the textbook this semester, but the material will usually come from the Chapters listed below. Focus first on the material that is directly covered in classes and assigned or recommended. Explore the additional material in the textbook for your own interest and enrichment.

Chapter 1: Essential Ideas

Chapter 2: Atoms, Molecules, and Ions

Chapter 3: Electronic Structure and Periodic Properties of Elements

Chapter 4: Chemical Bonding and Molecular Geometry

Chapter 5: Advanced Theories of Bonding

Chapter 6: Composition of Substances and Solutions

Chapter 10: Liquids and Solids

Chapter 11: Solutions and Colloids

Chapter 19: Transition Metals and Coordination Chemistry

Chapter 21: Organic Chemistry

Other Items

- A link to the official Loyola calendar can be found here: <https://www.luc.edu/academics/schedules/>
- The Withdraw deadline for the term is on Friday, June 23, 2023.
- Loyola is using SmartEvals to provide instructor & course feedback. OIE will send emails near the end of the term.
- A tentative class schedule is available on Sakai, and pre-lecture readings will be continually updated on Sakai. Please be prepared to help your classmates get caught up if they miss a class for any reason. Establish a communication plan to share notes/topics/outlines as needed.
- Additional resources, advice, and suggestions for success (from multiple sources) will be posted/updated on Sakai.

• Grading information is on the next pages, and I hope that the measure of what you gain from this course will include much more than the letter on your transcript. Your success in this course is important to me. Let me know what I can do to help you meet your needs and fulfill the requirements to succeed. – Dr. Helquist

Course Grading System

All of the following are required components of your course grade, no additions, no substitutions:

ALEKS: Required Homework

Online, at www.aleks.com, with additional information and tips posted on Sakai. At the end of the semester, your Overall ALEKS grade is calculated from: 50% Modules + 5% Final Knowledge Check + 45% Pie Progress. Regular work (Learning topics in Modules) is due 5-6 times per week at 11:59pm as a combination of pre- and post-lecture work. Assessments or “Knowledge Checks” are also included to help you retain course content throughout the entire semester. Chemistry is a complex and challenging subject, so we have chosen ALEKS to make sure you master the basic, fundamental concepts in the course to fully advance your personal educational and career goals. We have solid data that show this service can improve mastery and retention, particularly for students who would otherwise have difficulty passing. What you must do is decide to trust the system when it assigns you work: trust that this is indeed the work you should be doing now, and that doing it diligently will build the essential mastery you need to succeed in chemistry as fast as possible. ALEKS will help you by finding out YOUR individual state of knowledge, and then tutoring you in only the topics on which YOU need to work. The list of topics to be mastered has been set for the course, and it is the same for everybody. But YOUR individual path is going to be unique to you. We will drop your lowest 2 Module scores from the overall grade calculation at the end of the semester to account for the instances when you may not be able to finish an assignment by the deadline.

Group Work

On average, 3 assignments per week, usually completed in assigned groups. Assignments will be completed both in and outside of class and submitted to Gradescope. The purpose of participation is to improve your learning by: 1) cooperation, communication and support among your classmates as you practice the skills required for success in the course; and 2) providing feedback on your progress to encourage reflection and improvement. Some assignments will include test questions from previous semesters. You will get as much benefit from these assignments as you choose to put forth in your effort and you are expected to correct your work after receiving feedback. Each assignment will contribute equally toward this category in your course grade. Refer to the Universal Absence Accommodation Policy for missed assignments.

Foundational Objectives (FOs): Mastery Testing

The purpose of testing is to align your course grade with your level of learning, based on your mastery of Foundational Objectives (FOs). The FOs are all related to the Course Content & Learning Outcomes on the first page of this syllabus. A list of FOs will be updated for each unit as we progress through the material. Questions will be scored as Mastered or Not Mastered for each FO. A score of Mastered is earned for correctness and completeness of the problem(s), and each FO may only be counted once toward your FO Mastery Standard. You will have multiple chances to demonstrate mastery of all the FOs during the term: for example, if you receive a score of Not Mastered for any FO on the first test (or if you choose not to attempt an FO), you can try again to earn a score of Mastered for that FO on the second test. Revision of work that does not meet mastery standards is expected for your learning. Because you will have more than one chance to master the FOs, you will also be able to choose which FOs to work toward for the course. Note that the standards for earning Mastery will be high: by definition, there is no partial credit, but you will learn the standards from the examples for class activities. Rounds of testing are scheduled for Friday each week, with the final round scheduled during the final exam period. Specific FO dates and timing will be announced as we proceed through the course material each week. All procedures, allowed resources, and requirements will be posted before each round of testing. Refer to the Universal Absence Accommodation Policy for missed tests.

Comprehensive Objectives: Mastery Testing & Proficiency Revisions

The purpose of testing is to align your course grade with your level of learning, based on your mastery of comprehensive topics. The purpose of COs is to allow you to demonstrate your higher-level skills of applying and analyzing, requiring you to go beyond memorization of facts and processes and transfer your understanding of essential course concepts to new scenarios. The COs are all related to the Course Content & Learning Outcomes on the first page of this syllabus. A list of COs will be updated for each unit as we progress through the material. COs will be scored as Mastered or Not Mastered. A score of Mastered is earned for correctness and completeness of the problem(s). Note that the standards for earning Mastery will be high: by definition there is no partial credit, but you will learn the standards from the examples for class activities. Each round of testing on COs will be followed by an opportunity to resubmit work to earn a score of Proficient for an CO that was Not Mastered in the first testing opportunity. Resubmissions for Proficiency will also earn reattempts of COs. Reattempts will take place with the next round of testing. Note that your grade will not count both Mastery and Proficiency for the same item; a CO that is scored Proficient and then is subsequently Mastered on a re-attempt will count only as being Mastered. Rounds of testing are scheduled for Friday each week, with the final round scheduled during the final exam period. Specific CO dates and timing will be announced as we proceed through the course material each week. All procedures, allowed resources, and requirements will be posted before each round of testing. Refer to the Universal Absence Accommodation Policy for missed tests.

Free-response Tests

The purpose of free-response tests is to allow you to demonstrate your higher-level skills of applying and analyzing, requiring you to go beyond memorization of facts and processes and transfer your understanding of essential course concepts to new scenarios. The topics for the free-response tests are all related to the Course Content & Learning Outcomes on the first page of this syllabus. A list of learning goals will be updated for each unit as we progress through the material. Rounds of testing are scheduled for Friday each week, with the final round scheduled during the final exam period. Refer to the Universal Absence Accommodation Policy for missed tests. The final is cumulative and comprehensive, completed on paper, in class on the last day of the term. Questions may include all material assigned for the semester. The final exam will not be returned, and a score will be posted on Sakai. Note that taking the final exam is mandatory to earn a passing course grade (C- or higher). To reward improvement and to accommodate an exam absence, your tests percentage will be automatically calculated to drop your lowest midterm score:

Average of highest 4 midterms 75%

<u>Final Exam</u>	25%*
Overall tests percentage	100%

*the final exam is mandatory

Course Grading System Design

There are three basic principles that I have used to design the grading system for this course. These are for you to:

1. Understand what the standards and requirements are for each letter grade so that you can choose what level of academic achievement to pursue in this course. I encourage each of you to strive for high achievement because I believe in the potential of all students to learn and improve their abilities in chemistry.
2. Expect a challenging but flexible learning environment. The standards for demonstrating your Mastery of the course material are high in each area, but the methods for meeting the standards are designed to give you multiple chances to revise and improve the quality of your work throughout the semester.
3. Learn from mistakes. Deep, connected learning involves hard work and reflection on your progress. Chemistry is a cumulative subject where the new topics build on prior knowledge and this system is designed for cycles of learning.

Standards

The standards for each letter grade are listed here according to all required course components, listed in columns. You must meet or exceed all of the standards listed to earn the corresponding letter grade: standards are not averaged across components. These lists are intended for complete transparency: you do not need to do any extra work to figure out what is required for any grade, and we will revisit the standards and expectations after the early rounds of testing to help you gauge your progress in the course. Grades are only based on the criteria listed in the syllabus: no substitutions, and no additions. No rounding or extra credit will be considered. Descriptions of the components are found on the preceding pages.

A Standards

FO Mastery: ≥ 23
 CO Mastery: $\geq 4 + 1$ Proficiency
 Tests: $\geq 90\%$ Overall percentage
 ALEKS: $\geq 95\%$ Overall Grade
 $\geq 100\%$ Pie Progress
 Final Knowledge Check
 Group Work: $\geq 90\%$

B Standards

FO Mastery: ≥ 21
 CO Mastery: $\geq 2 + 2$ Proficiency
 Tests: $\geq 75\%$ Overall percentage
 ALEKS: $\geq 80\%$ Overall Grade
 $\geq 85\%$ Pie Progress
 Final Knowledge Check
 Group Work: $\geq 80\%$

C Standards

FO Mastery: ≥ 19
 CO Mastery: $\geq 1 + 3$ Proficiency
 Tests: $\geq 60\%$ Overall percentage
 ALEKS: $\geq 70\%$ Overall Grade
 $\geq 75\%$ Pie Progress
 Group Work: $\geq 70\%$

A- Standards

FO Mastery: ≥ 22
 CO Mastery: $\geq 3 + 2$ Proficiency
 Tests: $\geq 85\%$ Overall percentage
 ALEKS: $\geq 90\%$ Overall Grade
 $\geq 95\%$ Pie Progress
 Final Knowledge Check
 Group Work: $\geq 90\%$

B- Standards

FO Mastery: ≥ 20
 CO Mastery: $\geq 2 + 2$ Proficiency
 Tests: $\geq 70\%$ Overall percentage
 ALEKS: $\geq 80\%$ Overall Grade
 $\geq 85\%$ Pie Progress
 Final Knowledge Check
 Group Work: $\geq 80\%$

C- Standards

FO Mastery: ≥ 19
 CO Mastery: $\geq 1 + 2$ Proficiency
 Tests: $\geq 55\%$ Overall percentage
 ALEKS: $\geq 70\%$ Overall Grade
 $\geq 75\%$ Pie Progress
 Group Work: $\geq 70\%$

B+ Standards

FO Mastery: ≥ 21
 CO Mastery: $\geq 3 + 2$ Proficiency
 Tests: $\geq 80\%$ Overall percentage
 ALEKS: $\geq 85\%$ Overall Grade
 $\geq 90\%$ Pie Progress
 Final Knowledge Check
 Group Work: $\geq 80\%$

C+ Standards

FO Mastery: ≥ 20
 CO Mastery: $\geq 2 + 2$ Proficiency
 Tests: $\geq 65\%$ Overall percentage
 ALEKS: $\geq 80\%$ Overall Grade
 $\geq 85\%$ Pie Progress
 Group Work: $\geq 70\%$

D Standards

FO Mastery: ≥ 12
 CO Mastery: $\geq 0 + 2$ Proficiency
 Tests: $\geq 40\%$ Overall percentage
 ALEKS: $\geq 55\%$ Overall Grade
 Group Work: $\geq 50\%$

Note: a student who fails to meet the standards for a grade of D will receive a grade of F for the course.

Posting of Grades

Final course grades at the end of the term are posted only LOCUS. Grades are never sent via email. ALEKS scores are automatically recorded in the ALEKS Gradebook for that system. Scores for all other required components will be made available on Sakai and/or Gradescope. Each student will see an estimated midterm grade in LOCUS before the withdraw deadline.