

Advanced Inorganic Chemistry

Instructor: Adri Takacs (atakacs1@luc.edu)

Office: FH 200A

Office Hours: Thursday 10:00-11:30 am FH200A

Class Meeting Schedule:

Lecture: Tuesdays & Thursdays from 8:30 – 9:45 am (Flanner Hall 105)

Discussion: Friday from 11:30 am – 12:20 pm (Flanner Hall 129)

Description: CHEM 340/441 will provide the students with a detailed examination of several topics pertaining to modern inorganic chemistry. These topics include structure and bonding theories, symmetry and group theory, solid state chemistry, acid-base chemistry, coordination chemistry and organometallic chemistry.

Textbook: Inorganic Chemistry – 5th Edition. by C. E. Housecroft and A. G. Sharpe.

Graded Components

Discussion: Students will work in small groups to discuss ideas and come to a consensus about answers to questions. Ideas are further developed in questions that force application of the agreed upon concepts. This format is designed based on the idea that learning cannot be directly transmitted from one person to another. The grade is based on participation. There are a total of 13 discussions assignments over the course of the semester. The lowest 2 discussion scores will be dropped. Thus, you may miss two discussions without impacting your grade.

Problem Sets: Problem sets consist of 5 problems and are graded on a 0, 1, 2, 3 scale for each problem. 0 points indicates the problem was not done. 1 and 2 points indicate no/incorrect work or an incorrect answer. 3 points will be awarded for correct work leading to a correct answer. *The problem sets must be completed individually; it is not group work. Copying other's work and presenting that work as one's own is an example of academic dishonesty.

Presentations: Students will work in small groups to present on a topic relevant to modern inorganic chemistry applications. Presentations will be scheduled during the last 2 weeks of the semester. Presentations will be worth 100 points. More info coming later!

Exams: A typical exam will be slightly more difficult than the discussions and problem sets. There are three exams and a cumulative final exam. Exams should not be missed, but in the case of hardship or debilitating illness can be made up. Under such circumstances, evidence of hardship should be presented, and we can arrange a makeup exam. This must be scheduled within one week of the original exam date. Tentative Exam dates: 2/6, 3/12, and 4/11

Final Exam: The University sets the schedule for all final exams. The final will be held on: **Saturday, May 4, 2024, from 9:00-11:00 am CST.** You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you arrive late. There will be no make-up final exams given under any circumstance, and the exam cannot be given early. Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams. Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. If a student reports

having four final examinations scheduled for the same date, students should be directed to e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (apatricoski@luc.edu).

Grading Scheme:		Letter Grade Cutoffs:			
Problem Sets	10%	A	90.0	C+	70.0
Discussion	15%	A-	86.0	C	66.0
Presentation	15%	B+	82.0	C-	62.0
Exams	40%	B	78.0	D	54.0
Final Exam	20%	B-	74.0	F	< 53.9%
Total	100%				

Course Evaluation: Towards the end of the course, you will receive an email from the Office of Institutional Effectiveness to provide feedback on the course. You will receive consistent reminders throughout the period when the evaluation is open, and the reminders will stop once you 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 your grade. The feedback is important so that the instructor can gain insight into how to improve 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 obtain a signature from 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.

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. Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

Student Accommodations: The Student Accessibility Center (formerly known as Services for Students with Disabilities), Sullivan Center (773-508-3700), <http://www.luc.edu/sac>, has the mission "to serve students with documented disabilities by creating and fostering an accessible learning environment," including "support[ing] faculty, staff, and administrators on matters such as ADA and Section 504 compliance, as it relates to individuals 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 (develop standard form on web) 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 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.

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 will be reported to The Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be. With a zero-tolerance policy, punishment for cheating may range from receiving an F grade for the assignment to receiving an F for the course and possibly suspension and/or expulsion from the University.

Privacy Statement: Assuring privacy among faculty and students engaged in online or 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.

Returning to Campus: Please be familiar with and adhere to all guidelines posted on the On-Campus Guidelines in Classroom Scenarios of the Return to Campus Guidelines site:

(<https://www.luc.edu/returntocampus/classroomscenarios/>)

Mask Policy: Will follow any LUC mandated policies. As of Spring 2024, masks are not required.

- Atomic Orbitals and the Periodic Table (Chapter 1)
 - Quantum numbers and the hydrogen atom
 - Multi-electron atoms
 - The periodic table
 - The Aufbau principle
- Symmetry and Group Theory (Chapter 3)
 - Symmetry elements
 - Point groups and molecular symmetry
 - Character tables
- Valence Bond and Molecular Orbital Theory (Chapters 5, 2.3, 2.7, 2.8)
 - The covalent bond
 - Valence bond theory
 - Hybridization
 - Molecular orbital theory
 - VSEPR
- Ionic Solids (Chapter 6, page 1040 and 1045)
 - Ionic bonds
 - Lattice energies
 - Band theory
 - Conductivity
- Coordination Chemistry – Structure, Bonding, Spectra and Magnetism (Chapters 2.9, 7.11, 7.12, 7.13, 20.1–20.11 and 19.7, 19.8)
 - Structure and bonding
 - Ligands
 - Coordination numbers
 - Valence bond theory
 - Crystal field theory
 - Molecular orbital theory
 - Spectroscopy and magnetism
 - Electronic spectra
 - Tanabe-Sugano diagrams
 - Magnetic properties
 - Chelate and macrocycle effects
- Coordination Chemistry – Reactions, Kinetics and Mechanisms (Chapter 26)
 - Substitution kinetics
 - Electron transfer kinetics
 - Reactions of coordinated ligands
- Organometallic Chemistry (Chapters 24 and 25.1–25.6)
 - The 18-electron rule
 - Metal carbonyl complexes
 - Nitrosyl complexes
 - Metal alkyls, carbenes, carbynes and carbides
 - Nonaromatic alkene and alkyne complexes
 - Metallocenes
 - Reactions of organometallic complexes
 - Catalysis
- Acid-Base Chemistry (Chapters 7.1–7.9 and 9)