

Advanced Inorganic Chemistry
Chemistry 340/441
Fall 2019

Description: CHEM 340/441 will provide the students will 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.

Instructor: Wei-Tsung Lee, office FH 402 A, telephone (773)508-3205.

Time and Location: Tuesday and Thursday, 1:00–2:15 pm, FH 105 (lecture)
Thursday, 2:30–3:20 pm, FH 105 (discussion)

Office Hours: Tuesday, Wednesday, and Thursday 4:00–5:00 pm.

Textbook: *Inorganic Chemistry – 4th Edition.* by C. E. Housecroft and A. G. Sharpe.

Grading: You have two other avenues of learning besides lecture, which will prepare you for the exams. The first is discussion, where preparatory problems are demonstrated. After demonstration, roughly half the class period will be spent working through similar problems, and then more challenging problems. These are collected and graded based on completion; a total of 14 discussions (10 pts each) are collected, though the points for this category (120 pts) maxes out at 12 sessions. Thus you may miss one discussions without impacting your grade. The second is problem sets which each set consists of 5 problems and are graded on a 0, 1, 2, 3 scale for each problem for a total of 15 points per set. 0 points indicates the problem was not done. 1 and 2 points indicate no/incorrect work or an incorrect answer. 3 points is for correct work or a correct answer.

A typical exam will be slightly difficult than the discussions and problem sets. There are three exams, each worth 100 points, and a final (150 pts) which is cumulative. 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 you and I can arrange a makeup. This must be scheduled within one week of the original exam date.

Grading Scale:

Problem sets (9%)	4 × 15 pts	60
Discussion (19%)	14 × 10 pts	120 (two can be missed)
Exams (48%)	3 × 100 pts	300
Final (24%)	150 pts	<u>150</u>
Total		630

Letter Grade:

A: 100-87%, A-: 87-84%, B+: 84-81%, B: 81-77%, B-: 77-74%, C+: 74-71%, C: 71-67%, C-: 67-64%, D+: 64-61%, D: 61-57%, D-: 57-54%, F < 54%

In light of the recent federal privacy act, grades will not be posted nor will graded work be left outside my door. I will be available during normal office times to discuss mid-term grades during the week preceding the final drop date. I will hand back graded work once in class and thereafter when a student comes to my office, with ID, to pick it up.

Final Exam: The University sets the schedule for all final exams. The final will be held on: 12/13/2019 (Friday) at 1:00 pm in FH 105. 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 will not be given early, either. 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 Lester Manzano, Assistant Dean for Student Academic Affairs, CAS Dean's Office (lmanzan@luc.edu).

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.

Students with Disabilities: If you have any special needs, please let me know in the first week of classes. The university provides services for students with disabilities. Any student who would like to use any of these university services should contact the Services for Students with Disabilities (SSWD), Sullivan Center, (773)508-3700. Further information is available at <http://www.luc.edu/sswd/>.

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.

Loyola University Absence Policy for Students in Co-Curricular Activities: 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>)

Computers and Cell Phones: All laptops, computers, and cell phones must be turned off prior to the beginning of class.

Recording Devices: No audio or video recordings of the class lectures are permitted. Any violation of this will result in an automatic failure.

Class Attendance: Your grade is based in part on classroom attendance and participation. Therefore, it behooves you to attend all classes.

Schedule and Approximate Syllabus:

1. Atomic Orbitals and the Periodic Table (Chapter 1)
 - Quantum numbers and the hydrogen atom
 - Multi-electron atoms
 - The periodic table
 - The *aufbau* principle

2. Symmetry and Group Theory (Chapter 3)
 - Symmetry elements
 - Point groups and molecular symmetry
 - Character tables

3. 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

4. Ionic Solids (Chapter 6, page 1040 and 1045)
 - The ionic bond
 - Lattice energies
 - Band theory
 - Conductivity
 - Applications

5. Acid-Base Chemistry (Chapters 7.1–7.9 and 9)

6. 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

7. Coordination Chemistry – Reactions, Kinetics and Mechanisms (Chapter 26)
 - Substitution kinetics
 - Electron transfer kinetics
 - Reactions of coordinated ligands

8. 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