Advanced Inorganic Chemistry
Chemistry 340/441
Fall 2014

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, telephone (773)508-3205.

Time and Location: Tuesday and Thursday, 2:30–3:45 pm, FH 105 (lecture)
Wednesday, 2:45–3:35 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 two discussions without impacting your grade. The second is problem sets which are collected on five Thursdays. Each set consists of 5 problems and are graded on a 0, 1, 2 scale for each problem for a total of 10 points per set. 0 points indicates the problem was not done. 1 point indicates no/incorrect work or an incorrect answer. 2 points is for correct work or a correct answer.

A typical exam will be about 25–40% more difficult than the 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	5 × 10 pts	50	A > 87%
Discussion	14 × 10 pts	120 (2 can be missed)	B > 77%
Exams	3 × 100 pts	300	C > 67%
Final	150 pts	150	D > 57%
Total		620	

Pluses and minuses are not indicated in the grading scale but will be given. This will be done according to natural breakdown of the grade distributions. Expect this to be the closest to 1–2% to the final A–B, B–C, and C–D divisions.

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.

Academic Honesty and Discipline: In the problem set, no student will submit work that is not his/her own by verbatim copying the work of another student or by using the work or solutions from this course in previous years. During the examination, a student will not either accept or use information of any kind from other students or use aids to memory other than those expressly permitted by the examiner. Departure from the above standard will result in disciplinary penalties that range anywhere from deduction of points to awarding a failing grade for the entire class. If a student is caught cheating, 100 points will be deducted from the total grade, and he/she will be brought to the attention of the Department Chair and Dean of the College who will determine if further action should be taken. Full details on Loyola University's academic policy can be found at the following site: http://www.luc.edu/media/lucedu/cas/pdfs/academicintegrity.pdf

Disabilities: Students who have disabilities which they believe entitle them to accommodations under the Americans with Disabilities Act should register with the Services for Students with Disabilities (SSWD) office. To request accommodations, students must schedule an appointment with an SSWD coordinator. Students should contact SSWD at least four weeks before their first semester or term at Loyola. Returning students should schedule an appointment within the first two weeks of the semester or term. More information is available at: http://www.luc.edu/sswd/register.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