

Chemistry 307

Inorganic Chemistry
Spring 2020

Instructor: Dr. Wei-Tsung Lee, Flanner Hall 402A; Ext. 83205; E-mail: wlee5@luc.edu

Lecture: M, W and F 12:35 – 1:25 p.m.; Cuneo Hall 002

Discussion: M, 1:40 – 2:30 p.m.; Dumbach Hall 117

Office Hours: W and F, 1:40 – 2:30 p.m.; Flanner Hall 402A; other times by appointment.

Class Pre-requisite: Chem 222 or 224 and 226

Required Textbook: Inorganic Chemistry, 7th Edition, M. Weller, T. Overton, J. Rourke and F. Armstrong, ISBN: 978-0-19-876812-8, Oxford University Press, 2018

Abbreviated solutions to self-tests and exercises from the book can be found online and in Sakai: https://oup-arc.com/access/ichem7e-student-resources#tag_answers-to-self-test-questions

Recommended Materials: Molecular Model Kit, ISBN-09648837-0-8 (2001), by Stephen Darling (see www.molecularvisions.com or www.darlingmodels.com). Model kits for organic chemistry classes do not contain pieces for constructing octahedral and trigonal bipyramidal shapes, etc. which are common in inorganic chemistry. Rather than buying the recommended Molecular Model Kit, some students prefer to access the free website <http://symmetry.otterbein.edu/tutorial/pointgroups.html> for visualization of symmetry elements and assignments of point groups.

Course Description and Learning Outcomes: Master basic concepts in inorganic chemistry, such as structure and bonding, transition metal chemistry and organometallics, as well as obtain an appreciation for the role of metal ions in biological systems.

Course/Instructor Evaluation: After the withdrawal deadline (Monday, March 23th) and up to the last day of classes, students will be given the opportunity to evaluate both the instructor and the course by using an online survey. The essential objective for this course is “Gaining a basic understanding of the subject (e.g., factual knowledge, methods, principles, generalizations, theories)”, and the important objective is “Learning to apply course material (to improve thinking, problem solving, and decisions).”

CHEM 307 is an advanced upper-level class and, for Private Tutoring, you may wish to seek the help of an advanced student who has successfully completed the course or of a graduate student who is conducting research in the area of inorganic chemistry.

Sakai and Lecture Notes: The instructor will upload lecture notes and slides on Sakai, and will make every effort to have the materials posted on the site at least a day before the lecture. A word of foreknowledge is that the PowerPoint presentations can be quite large (on the order of megabytes) and hence, if you do not have a high-speed internet connection at home, you should consider using Loyola’s computer resources to download the materials.

Grading Policy: 100 points for each of the two 50-min exams, 25 points for each of the four 15-min quizzes, and 200 points for the final exam for a grand total of 500 points. The exams will consist of multiple-choice and short-answer questions, but the quizzes will only contain multiple-choice questions. The final exam will be comprehensive with 60% covering material since Exam II and the remaining 40% on the material from Exams I and II. No makeup exams or quizzes will be given. For missed exams, a **written** doctor's or judge's excuse, or a letter from a funeral director, or a notification of a Medical School interview is required; the score for a missed exam or quiz will be determined from the scaled scores in the other exams and quizzes. Exceptions are, however, made for Students involved in Co-Curricular Activities. In those cases, the Loyola University Absence Policy is followed:

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. 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/athleteadvising/attendance.shtml> 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.

Class grades: Total raw scores will also be used to establish final letter grades:

A = 100-85; A⁻ = 84-80; B⁺ = 79-75; B = 74-70; B⁻ = 69-65; C⁺ = 64-60; C = 59-55; C⁻ = 54-50; D⁺ = 49-45; D = 44-40; F = Less than 40

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 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: 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 Student Accessibility Center (SAC), Sullivan Center, (773) 508-3700. Further information is available at <http://www.luc.edu/sac>

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 or in this syllabus) will be reported to Professor Miguel Ballicora, the Chairperson of the Department of Chemistry & Biochemistry, who will decide what the next steps may be. Any student found cheating on any examination or quiz will receive a "0" for that assignment. Moreover, depending on the severity of the misconduct, a final grade of F may be assessed for the course. We remind you that such an incident will become part of one's personal record and may be transmitted to organizations, such as medical or dental schools, pharmacy and graduate programs.

Appropriate In-class Behavior and Electronic Devices: It is incumbent upon you, as a student, to maintain a professionalism and code of conduct appropriate with the course material and course enrollment. To this end, rude, disruptive behavior (such as talking during class, viewing computer materials not concerning class subjects, etc...) will not be tolerated. It is acceptable to use laptops or comparable devices (tablets, iPads, etc.) for taking notes in class. Voice recording but not visual recording is allowed. Cell phones, pagers, etc. must be turned off during class. If your device is activated during class, you must leave the class immediately and cannot return for the duration of that class period.

Error Policy: The instructor reserves the right to amend or correct this syllabus.

Tentative Schedules:

| Lecture # | Date | Topic | Reading |
|-----------|------|---|------------------|
| 1 | 1/13 | Atomic Structure | Ch. 1 |
| 2 | 1/15 | Shielding | Ch. 1 |
| 3 | 1/17 | Atomic Properties | Ch. 1 |
| 4 | 1/22 | Molecular Shapes and VSEPR | Ch. 2.1–2.3 |
| 5 | 1/24 | Symmetry Elements | Ch. 3.1 |
| 6 | 1/27 | Point Groups | Ch. 3.1 |
| 7 | 1/29 | Polarity and Chirality | Ch. 3.3, 3.4 |
| 8 | 1/21 | VB Theory of Diatomics and Polyatomics | Ch. 2.4–2.6 |
| 9 | 2/3 | MO Theory of Homo- and Hetero-Diatomics | Ch. 2.7–2.9 |
| 10 | 2/5 | MO Theory of Polyatomics | See Power Points |
| 11 | 2/7 | Review | |
| 12 | 2/10 | EXAM I (Lectures 1 – 10) | |
| 13 | 2/12 | Acids and Bases | See Power Points |

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| 14 | 2/14 | Nomenclature of Coordination Compounds | Ch. 7.1, 7.2 |
| 15 | 2/17 | Coordination Numbers | Ch. 7.3–7.6 |
| 16 | 2/19 | Isomerism of Coordination Compounds | Ch. 7.7–7.10 |
| 17 | 2/21 | Crystal Field Theory | Ch. 20.1 |
| 18 | 2/24 | Crystal Field Theory (cont.) | Ch. 20.1 |
| 19 | 2/26 | Magnetochemistry | Ch. 20.1, 20.8 |
| 20 | 2/28 | Crystal Field Theory (cont.) | Ch. 20.1 |
| 21 | 3/9 | Ligand Field Theory | Ch. 20.2 |
| 22 | 3/11 | Review | |
| 23 | 3/13 | EXAM II (Lectures 13 – 21) | |
| 24 | 3/16 | Term Symbols | Ch. 20.3 |
| 25 | 3/18 | Electronic Spectra | Ch. 20.4–20.6 |
| 26 | 3/20 | Electronic Spectra (cont.) | Ch. 20.4–20.6 |
| 27 | 3/23 | Electronic Spectra (cont.) | Ch. 20.4–20.6 |
| 28 | 3/25 | Substitution Reactions in O_h Complexes | Ch. 21.1–21.2, 21.6–21.7 |
| 29 | 3/27 | Substitution Reactions in D_{4h} Complexes | Ch. 21.3–21.4 |
| 30 | 3/30 | Electron Transfer Reactions | Ch. 21.10–21.12 |
| 31 | 4/1 | Bioinorganic Chemistry | Ch. 26 |
| 32 | 4/3 | Bioinorganic Chemistry (cont.) | Ch. 26 |
| 33 | 4/6 | Bioinorganic Chemistry (cont.) | Ch. 26 |
| 34 | 4/8 | Metals in Medicine | Ch. 27 |
| 35 | 4/15 | Metals in Medicine (other) | See Power Points |
| 36 | 4/17 | 18- e^- rule and Nomenclature of organometallic cpds | Ch. 22.1–22.4 |
| 37 | 4/20 | Carbonyl and π -donor Complexes | Ch. 22.5–14, 22.17, 22.18g |
| 38 | 4/22 | Organometallic Rxns & Catalysis | Ch. 22.21–26, 22.28, 22.32 |
| 39 | 4/24 | Review | |

The final examination will be on Fri, 5/1, 9:00 – 11:00 a.m., Cuneo Hall 002 (60% on Lectures 24-38; 20% on Lectures 1-10, and 20% on Lectures 13-21).