

Chemistry 307

Inorganic Chemistry

Spring 2021

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

Office Hours: W and F, 1:40 – 2:30 p.m. or by appointment.

Teaching Assistant: Bailey Hanson; Email: bhanson2@luc.edu

Office Hours: M and T, 3:00 – 4:00 p.m. or by appointment.

Time and Location: This course will be delivered virtually by hybrid formats: both synchronous and asynchronous. All lectures will run asynchronously through Panopto from Sakai. All discussion sections will be held synchronously through Zoom (held by Bailey Hanson): Thursdays, 2:30–3:20 pm. **Note: The first lecture will be conducted synchronously through Zoom (1/18/2021, 1:00 pm).**

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 <https://symotter.org/> 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 29th) 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. Students must provide their instructors with proper documentation describing the reason for and date of the absence: <https://www.luc.edu/athleteadvising/attendance.shtml>. 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.

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.

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.

Recording of Zoom Class Meetings: In this class software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available *only* to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. All recordings will become unavailable to students in the class when the course has concluded. Students will be required to turn on their cameras at the start of class. Students who

have a need to participate via audio only must reach out to me to request audio participation only without the video camera enabled. The use of all video recordings will be in keeping with the University Privacy Statement shown below.

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

Schedule and Approximate Syllabus:

Lecture #	Date	Topic	Reading
0	1/18	Introduction	
1	1/20	Atomic Structure	Ch. 1
2	1/22	Shielding	Ch. 1
3	1/25	Atomic Properties	Ch. 1
4	1/27	Molecular Shapes and VSEPR	Ch. 2.1 – 2.3
5	1/29	Symmetry Elements	Ch. 3.1
6	2/1	Point Groups	Ch. 3.1
7	2/3	Polarity and Chirality	Ch. 3.3, 3.4
8	2/5	VB Theory of Diatomics and Polyatomics	Ch. 2.4 – 2.6
9	2/8	MO Theory of Homo- and Hetero-Diatomics	Ch. 2.7 – 2.9
10	2/10	MO Theory of Polyatomics	See Power Points
	2/15	Review	
	2/17	EXAM I (Lectures 1 – 10)	
11	2/19	Acids and Bases	See Power Points
12	2/22	Nomenclature of Coordination Compounds	Ch. 7.1, 7.2
13	2/24	Coordination Numbers	Ch. 7.3 – 7.6
14	2/26	Isomerism of Coordination Compounds	Ch. 7.7 – 7.10
15	3/1	Crystal Field Theory	Ch. 20.1
16	3/3	Crystal Field Theory (cont.)	Ch. 20.1
17	3/5	Magnetochemistry	Ch. 20.1, 20.8

18	3/12	Crystal Field Theory (cont.)	Ch. 20.1
19	3/15	Ligand Field Theory	Ch. 20.2
	3/17	Review	
	3/19	EXAM II (Lectures 11 – 19)	
20	3/22	Term Symbols	Ch. 20.3
21	3/24	Electronic Spectra	Ch. 20.4 – 20.6
22	3/26	Electronic Spectra (cont.)	Ch. 20.4 – 20.6
23	3/29	Electronic Spectra (cont.)	Ch. 20.4 – 20.6
24	3/31	Substitution Reactions in O_h Complexes	Ch. 21.1-21.2, 21.6 – 21.7
25	4/7	Substitution Reactions in D_{4h} Complexes	Ch. 21.3 – 21.4
26	4/9	Electron Transfer Reactions	Ch. 21.10 – 21.12
27	4/12	Bioinorganic Chemistry	Ch. 26
28	4/14	Bioinorganic Chemistry (cont.)	Ch. 26
29	4/16	Bioinorganic Chemistry (cont.)	Ch. 26
30	4/19	Metals in Medicine	Ch. 27
31	4/21	Metals in Medicine (other)	See Power Points
32	4/23	18- e^- Rule and Organometallic Compounds	Ch. 22.1-22.4
33	4/26	Carbonyl and π -donor Complexes	Ch. 22.5-14, 22.17, 22.18g
34	4/28	Organometallic Rxns & Catalysis	Ch.22.21-26, 22.28, 22.32
	4/30	Review	

The final examination date: TBA (60% on Lectures 20 – 34; 20% on Lectures 1 – 10, and 20% on Lectures 11 – 19).