

Chemistry 453, Spring 2024: Advanced Inorganic Chemistry

Lecture = 10:00-10:50 MWF, DMC 211, Discussion section = 12:00-12:50 F, GFS 207
Prof: Smaranda Marinescu; Prof. Mark Thompson; TA: Dana Cheng-Tan

Chem. 453 is an advanced course in Inorganic Chemistry. The intent of this course is to give you a comprehensive picture of Inorganic chemistry. The course will start with a general discussion of periodic trends and the periodic table. Ligand types and very simple bonding pictures will be presented as a precursor to standard classification schemes for metal complexes. The goal is to be able to determine *a priori* if a given complex is apt to be stable. We will then develop a detailed picture of structure and bonding, with emphasis on a molecular orbital picture of bonding. We will cover both traditional inorganic complexes as well as organometallics. The discussion will require the application of symmetry analysis and group theory. We will also discuss the structure and bonding of solid state materials. We will follow with an introduction to inorganic electronic spectroscopy. We will finish the course with a discussion of mechanistic chemistry, covering substitution, organometallic and electron transfer reactions. You will be given ample notice of the reading assignments and it is expected that you read the material ahead of my lectures.

Text: Miessler & Tarr, "Inorganic Chemistry" (5th Edition)

Supplemental Texts: Shriver, Atkins & Langford, "Inorganic Chemistry"

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Grading: Homework: 9%; due on Wednesdays
Quizzes: 10% – ~10(1) quizzes/semester (n), but only $n-1$ quizzes will count towards your grade. The quiz with the lowest score or a quiz that was missed will be dropped. The quizzes will be taken on Fridays at the end of the lecture and will last approximately 15 min.

Midterms (3): 51% (Wednesday, February 7th, Friday, March 22nd, and Friday, April 19th)
Final: 30% (Monday, May 6th, 8-10 AM)

Make-up policy: Make-up quizzes and exams are subject to approval.

Outline (approximate)

- Introduction, atomic theory, periodic table and trends (Chapters 1 and 2)
- Lewis dot structures and the VSEPR model (Chapter 3)
- Symmetry and group theory (Chapter 4)
 - Symmetry elements
 - Character tables
- Molecular orbitals (Chapter 5)
- Vibrations (Lecture notes and handouts)
- Ligand field theory (Chapter 10)
- Solid State Chemistry (Handouts and Chapter 7)
- Solid State Theory, Band Structure, Density of States, etc. (Handouts)

- Electronic spectroscopy (Chapter 11 + handouts)
- Ligand types for inorganic complexes (Chapters 9, 13, and handouts)
 - Electronic structure and polarity of ligands
 - General classification of ligands, acid-base / donor-acceptor (Chapter 6)
- Classification of metal complexes (hand-outs + Chapters 8, 9 and 13)
 - MLX scheme, Oxidation and valence states, 18-electron rule
- Reaction mechanisms for metal complexes (Chapters 12 & 14)
 - Substitution chemistry of coordination complexes (Chapter 12)
 - Electron transfer reactions (Chapter 12 + handouts)
 - Organometallic reactions (Chapter 14)

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial

appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[*Counseling and Mental Health*](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[*988 Suicide and Crisis Lifeline*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[*Relationship and Sexual Violence Prevention Services \(RSVP\)*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)*](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[*Reporting Incidents of Bias or Harassment*](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[*The Office of Student Accessibility Services \(OSAS\)*](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[*USC Campus Support and Intervention*](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[*Diversity, Equity and Inclusion*](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[*USC Emergency*](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.