CHM 401 **Intermediate Inorganic Chemistry** **Fall 2022**

Prof. Daniel N. Huh

Mon/Wed/Fri 8:00am – 8:50am

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Office Hours: Tues/Wed 11am-12pm

Course Syllabus

Textbook: *Inorganic Chemistry* 5th or 4th Edition G. L. Miessler, P. J. Fischer and D. A. Tarr

Slack: This course will utilize Slack to communicate class material and to ask questions. If you have not yet been added to the channel, please contact the instructor.

Mask Policy: Instructor and students will be wearing masks in the classroom unless otherwise instructed by the University.

(course material may be subject to change during the semester)

Topics:

Section I

Chapter 2 Atomic Structure
- 2.1 Periodic Properties of Atoms

Chapter 3 Simple Bonding Theory
- 3.1 Lewis Electron-Dot Diagrams
- 3.2 Valence Shell Electron-Pair Repulsion Theory

Chapter 4 Symmetry and Group Theory
- 4.1 Symmetry Elements and Operations
- 4.2 Point Groups
- 4.3 Point Group Representations and Character Tables
- 4.4 Molecular Vibrations

Section II

Chapter 5 Molecular Orbitals
- 5.1 *s, p,* and *d* orbitals
- Homonuclear Diatomics
- Heteronuclear Diatomics
- Triatomics

Chapter 6 Acid-Base/Donor-Acceptor
- Hard-Soft Acid-Base Theory

Chapter 9 Coordination Chemistry
- Nomenclature
- Coordination Number (C.N.)

Section III

Chapter 10-11 Coordination Chemistry & Electronic Spectra
- Crystal Field Theory
- Ligand Field Theory
- Angular Overlap: σ- and π-bonding
- Electronic Spectra: absorption, spin-orbit coupling, selection rules

Chapter 12 Reactions and Mechanisms
- Dissociative, Associative, and Interchange Mechanisms
- Substitution, Oxidative Addition, Reductive Elimination

Chapter 13-15 Organometallic Chemistry
- Electron Counting and the Covalent Bonding Classification
- CO and Multiple Bonding

Presentations:
Groups will select 1 topic from the list below and provide a 20-minute recorded lecture about the topic. The recorded presentation will be posted to the Slack channel #presentations and the instructor and all students will ask questions.

Topics:

- Cativa Process
- Grubb's Catalyst (All Generations)
- Jacobsen's Catalyst
- Wilkinson's Catalyst
- Ziegler-Nata Catalyst

Presentation Criteria:

- Overview of catalyst – what does it accomplish and what is its global production/impact?
- Catalyst description – C.N., CFT, LFT, electron counting/CBC
- Describe the mechanism
- Future outlook

Grading:

Exam 1	100
Exam 2	100
Presentation	100
Final Exam	200
Problem Sets	100
TOTAL	600

Your score (%) on your Final Exam will replace your lowest Exam score only if this improves your overall grade. Late problem sets will not be accepted.

Academic Honesty
Students are expected to be honest in all academic work. A student's name on any written work, quiz or exam shall be regarded as assurance that the work is the result of the student's own independent thought and study. Work should be stated in the student's own words, properly attributed to its source. Students have an obligation to know how to quote, paraphrase, summarize, cite and reference the work of others with integrity. The following are examples of academic dishonesty.

- Using material, directly or paraphrasing, from published sources (print or electronic) without appropriate citation
- Claiming disproportionate credit for work not done independently
- Unauthorized possession or access to exams
- Unauthorized communication during exams
- Unauthorized use of another's work or preparing work for another student
- Taking an exam for another student
- Altering or attempting to alter grades
- The use of notes or electronic devices to gain an unauthorized advantage during exams
- Fabricating or falsifying facts, data or references
- Facilitating or aiding another's academic dishonesty
- Submitting the same paper for more than one course without prior approval from the instructors.

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 330 Memorial Union, 401-874-2098 (http://www.uri.edu/disability/dss/)

Tentative Schedule Fall 2022

Sept 7, Wed	Introductions/Syllabus
Sept 9, Fri	Atomic Structure
Sept 12, Mon	Periodic Trends and Lewis Electron-Dot Diagrams
Sept 14, Wed	Valence Shell Electron-Pair Repulsion Theory (VSEPR)
Sept 16, Fri	Symmetry Elements and Operations
Sept 19, Mon	
Sept 21, Wed	Point Groups (Assign Problem Set 1 on Sept 21)
Sept 23, Fri	
Sept 26, Mon	Point Group Representations and Character Tables
Sept 28, Wed	
Sept 30, Fri	
Oct 3, Mon	Molecular Vibrations (Problem Set 1 Due on Oct 3)
Oct 5, Wed	
Oct 7, Fri	Exam I
Oct 10, Mon	Columbus Day (*no class*)
Oct 12, Wed	*s, p,* and *d* orbitals
Oct 14, Fri	
Oct 17, Mon	Homonuclear Diatomics (assign Problem Set 2 on Oct 17)
Oct 19, Wed	
Oct 21, Fri	Heteronuclear Diatomics
Oct 24, Mon	
Oct 26, Wed	Triatomics (*mid semester*)
Oct 28, Fri	Hard-Soft Acid-Base Theory
Oct 31, Mon	
Nov 2, Wed	Coordination Chemistry Nomenclature (Problem Set 2 Due on Nov 2) *(deadline to select topic for presentations)*
Nov 4, Fri	Coordination Number (C.N.)
Nov 7, Mon	Exam II
Nov 9, Wed	Crystal Field Theory (CFT)
Nov 11, Fri	Veteran's Day (*no class*)
Nov 14, Mon	Ligand Field Theory (LFT)
Nov 16, Wed	
Nov 18, Fri	Electronic Spectra: absorption, spin-orbit coupling, selection rules
Nov 21, Mon	
Nov 23, Wed	
Nov 24-27, Thurs-Sun	Thanksgiving Recess (*no class*)
Nov 28, Mon	Mechanisms: Dissociative, Associative, and Interchange, Substitution, Oxidative Addition, Reductive Elimination
Nov 30, Wed	Electron Counting and Covalent Bond Classification
Dec 2,Fri	
Dec 5, Mon	CO and Multiple Bonding
Dec 7,Wed	
Dec 9,Fri	Presentations (*no class – recorded presentations – see above syllabus*)
Dec 12, Mon	Review
Dec 14, Wed	Reading Day
Dec 21, Wed	Final Exam 8am-10am