

Chem 6500 Syllabus (Fall 2021)
Reactivity and Mechanisms in Inorganic Chemistry

Instructors: Tianbiao Liu (Maeser 361)
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Office Hours: By appointment
Class Time: Tuesday 11:00 am –12:00 pm; Thursday 4:00 pm –5:30 pm
Class Location: W333

Required textbooks: No specific textbooks are needed. However, reference books given below are encouraged to purchase. All related materials would be available as printouts or via Canvas. Canvas handouts will be updated by each weekend.

Reference books:

1. “Advanced Inorganic Chemistry”, 6th Edition, F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, Wiley, 1999.
2. “The Organometallic Chemistry of the Transition Metals”, 5th Edition, R. H. Crabtree, Wiley, 2009.
3. “Organotransition Metal Chemistry: From Bonding to Catalysis”, 1th Edition, John Hartwig, Wiley.
4. “Reaction Mechanisms of Inorganic and Organometallic Systems”, R. B. Jordan, Oxford, New York, NY, 1997.

Grading*:	Literature presentation and discussion (3 × 20 + 8 × 5 points)	100
	Five homework sets: 50 × 3	150
	Midterm exam	100
	Final exam	100
		Overall: 400

*Note: Answers of problem sets must be turned in at the beginning of the next class. The deadline to turn in exam answers will be announced in the class when exams are distributed.

Tentative Grading Scale:

A-/A	90-100%
B-/B/B+	80-89%
C-/C/C+	70-79%
D/D+	60-69%

Class Schedule

<i>Transition metals and Applications in Catalysis and Materials</i>		
Date	Topic	Literature Discussion
08/30	Class introduction	
09/02	Basic concepts in Coordination and Organometallic Chemistry I	
09/07	Basic concepts in Coordination and Organometallic Chemistry II	A sample of literature discussion
09/09	Reactivity survey of TM complexes: I, Element Reactions	
09/14	Reactivity survey of TM complexes: II, Thermodynamics and Kinetics	
09/16	Catalysis Introduction I	Emmanuel
09/21	Catalysis Introduction II	
09/23	Group 3: Sc and Y	Keyang
09/28	Group 4: Ti, Zr, and Hf	
09/30	Group 5: V, Nb, and Ta	Liam
10/05	Group 6: Mo and W	
10/07	Group 6: Cr	Emmanuel
10/12	Group 7: Tc and Re	
10/14	Group 7: Mn	Keyang
<i>Fall Break: 10/15</i>		
10/19	Class review	
10/21	Mid-term exam	
10/26	Group 8: Ru and Os	
10/28	Group 8: Fe	Liam
11/02	Group 9: Co	
11/04	Group 10: Pd and Pt	Emmanuel
11/09	Group 10: Ni	
11/11	Group 11: Ag and Au	Keyang
11/16	Group 11: Cu	
11/18	Group 11: Cu	Liam
11/23	Group 12: Zn, Cd, and Hg	
<i>Thanksgiving 11/24-11/26</i>		
11/30	Rare Earth Metals I	
12/02	Rare Earth Metals II	
12/07	Class review	
12/09	Class review	
12/06	Final exam	

Course Content: The purpose of this course is to provide a broad survey of reactivity and mechanisms in

inorganic chemistry covering the entire periodic table, from transition metals to main group elements. To support the ongoing research activities in our inorganic division, we will have a primary emphasis on transition metal chemistry. There will be a weekly topic area, as listed above, with a format of combined lecture and discussion. For each week, the teaching time to cover the two topics may vary from one to another.

Typically, the first 2/3 of each class period will be the introduction of key principles delivered by the instructor, followed by a literature discussion led by a student. The instructor will provide at least two papers one week ahead of the discussion. The discussion leader will choose one paper and inform the entire class which paper he/she chooses to discuss at least three days prior to the discussion. It is mandatory for everyone to be highly involved in the literature discussions. Detailed criteria for how the discussions will be graded are presented on the next page. The instructor will lead a sample of the literature discussion during the second class. Copies of the chosen publications will be available on Canvas or as printouts.

Literature Discussion Guidelines

- 1) Each student will lead a total of **3** literature discussions.
- 2) Preparation for literature discussions:
The schedule of the literature discussion will be available on Canvas. The papers will be available on Canvas at least three days before they are to be discussed. Everyone is expected to have carefully read the paper(s) that will be discussed prior to coming to class.

- 3) Expectation for the discussion leader:

Provide a concise description of the following:

- a) Rationale for the research: background and motivations
- b) Experiments that were performed
- c) Interpretation of all figures/schemes
- d) Outcomes
- e) Answer questions from other students; instructor

It may be beneficial to prepare a short handout for the class, especially if items are not clearly described in the paper (e.g. key background information, synthetic equations, and molecule structures). For some particularly long papers, the instructor and students will decide on which aspects of the research are most pertinent to the class and this portion will be discussed. Don't ignore the supporting information (SI) for a paper. Because of page limitations, authors in many cases put a significant number of figures/schemes in the SI.

- 4) Expectation for discussion participants:
Each student is expected to actively participate in the literature discussions.
- 5) Grading:
Each student will be graded on your ability to effectively describe the contents of the paper and answer questions. You will lead a total of 3 literature discussions, with each being worth 20 points ($3 \times 20 = 60$ total points). You will also engage in 6 literature discussions as a participant by asking questions to earn up to 40 points: $8 \times 5 = 40$ points. Total literature discussion points: 100.

Withdrawal Policy and "I" Grade Policy

The administration of Chem 6500 will adhere strictly to the academic regulations stipulated in the most recent Schedule of Classes and the USU General Catalog. Withdrawal from the course will follow official USU procedures. Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term "extenuating circumstances" includes: (1) incapacitating illness which prevents a student from attending classes for minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

Plagiarism:

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and

clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.” The penalties for plagiarism are severe. They included warning or reprimand, grade adjustment, probation, suspension, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

University Standards of Academic Integrity – “the Honor System”

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.

The Honor Pledge:

To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: “I pledge, on my honor, to conduct myself with the foremost level of academic integrity.” A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge espouses academic integrity as an underlying and essential principle of the Utah State University community; understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and is a welcomed and valued member of Utah State University.

Students with Disabilities:

The American with Disabilities Act states: “Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program.” If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille.