

Advanced Inorganic Chemistry

Chem 4380, Spring 2018

Lecture (Laney-Manion 105): T and Th 8:00 am – 9:15 am

Instructor: Lei Yang
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Office hours: Wednesday and Friday, 2:00 pm – 5:00 pm

Use this time. It works best if you come to my office prepared with specific questions about lecture, lab or homework. Other times are available by appointment.

Text: *Inorganic Chemistry (6th Ed.)* by Shriver & Atkins, Macmillan Higher Education, 2014

Grading	Possible points
Individual presentation	250
Homework (20 pts each)	150
Two Exams (100 pts each)	200
Final exam (May 3 rd , 8:00-10:00 am)	200
TOTAL POSSIBLE	800

Grades: A = 720 – 800 points
B = 640 – 719.99
C = 560 – 639.99
D = 480 – 559.99
F < 600

Important Dates Mar. 30 Last day to drop a course with a W

Course Description Required course for the ACS-certified chemistry BS degree and an elective in the non-ACS certified chemistry BS degree. Emphasis on the periodic properties of the elements and how these derive from modern atomic theory. Uses modern theories of chemical bonding, including molecular orbital theory and symmetry, to outline the systematic chemistry of the transition metals as well as representative main group elements. Introduce bioinorganic chemistry. Emphasizes current primary inorganic literature sources. Three hours of lecture per week. Prerequisite: Grade of C or better in CHEM 4450.

Presentation At the end of the semester (see the schedule on page 5), students will give a 15 minutes individual oral presentation (12 minutes talk and 3 minutes questions). The whole presentation (including preparation) will be 250 points.

Guidelines:

1. Select **ONE** of the topics listed on page 3 to prepare your presentation. You have two weeks (Jan. 12 – Jan. 26) to decide which topic you want to take. Please let me know the topic you want before **5:00 pm of Jan. 26 (Friday)**. If

two students picked the same topic, first come first service. We will draw straws to determine the order of the presentations in our first class.

2. Once the topic is selected, the student and the instructor will meet **before 5:00 pm of Feb. 2 (Friday)** to discuss the topic. I will provide some references for you to start, but it's your responsibility to search more references from **major refereed literature sources**.

3. Before **5:00 pm of March 16 (Friday)**, students need to show me the **draft** of the presentation (**30 pts**) and I will provide suggestions.

4. **ONE** week before the formal presentation, students need to make a practice presentation (**30 pts**) to me. I will provide suggestions and students will make revisions accordingly. For instance, if the presentation is on April 17, the student needs to practice no later than April 10.

5. Suggested sections: **Introduction**, **Review of the selected important results** and **Future Research/perspective/direction**. The introduction will summarize the background materials needed to understand the topic. The review will summarize and evaluate the research advancement. This is the major section of the presentation and subsections might be necessary. The future work will discuss what questions/problems have to be answered/solved or any new directions in future. You don't have to follow my suggestions. Be creative! But you do have to have your own insight to your topic.

6. The caption of figures and tables should be clearly presented.

Reference format:

Taki, M.; Akaoka, K.; Iyoshi, S.; Yamamoto, Y. *Inorg. Chem.* **2012**, *51*, 13075

Note: Instead of a separate slide with all the references at the end of your presentation, references should be cited on each slide.

Grading policies:

1. Total grade for the presentation project is 250 pts. It contains four parts:

Part 1 (35 pts): Draft of your presentation before 5:00 pm of **March 16 (Friday)**.

Part 2 (35 pts): Practice presentation **ONE** week before the formal presentation.

Part 3 (100 pts): Your presentation grade from the audience.

The presentation from each speaker will be graded by other students and instructor based on the grading rubric (see next page). The highest and lowest grades will be dropped and the average value will be the final grade of the part 3 (out of 100).

Part 4 (80 pts): Your constructive comments for other speakers.

Your constructive comments/feedback for the sixteen speakers will be graded by the instructor. Credit won't be awarded for simple comments such as "Great job", "Nice presentation" et al. Each grading sheet with constructive comments/feedback is 80 pts/16 = 5 pts. You will give constructive comments/feedback

for at least two criteria (page 3) to get total 5 pts. Extra credit will be awarded for extra constructive comments/feedback in more criteria (1 pts/each criterion, 2 pts maximum for each presentation).

2. The grading sheets with constructive comments/feedback will be returned to the speaker after the final exam. **The name on the grading sheet will be erased before the returning.**

Grading criteria for presentation (part 3):

The students and instructor will give grades (out of 100) for the presentation based on the following grading rubric. The highest and lowest grades will be dropped and the average value will be the grade of the presentation.

1. **Chemistry content – 20 points** (goes beyond material covered in book and lecture; contains relevant reactions, mechanisms and explanations)
2. **Context/background/relevance/interest – 15 points** (background/purpose/context of presentation is clear; material is relevant and designed to evoke interest).
3. **Speaker's own insight/ideas/thoughts – 15 points** (Speaker presents his/her explanation/new thoughts/new ideas/proposals)
4. **Visual – 10 points** (good use of figures, pictures, models, videos etc.)
5. **Speaking – 10 points** (clarity, not reading from notes)
6. **Organization – 10 points** (flows logically in an understandable fashion; transitions clear, not too short or too long)
7. **References – 10 points** (material is taken from sources other than text; all references cited properly on each slide; quality of sources will be taking into account)
8. **Question and answer – 10 points** (questions answered knowledgeable)

Topics:

Note: You are not restricted to the topics listed below. If you are interested in other topics, you have to discuss with me before you start.

1. Metal organic framework for hydrogen storage
2. Structural/functional models of Cu₂ site in nitrous oxide reductase
3. Platinum anticancer agents
4. Methane monooxygenase – protein and models
5. Non-heme Iron oxygen chemistry – hemerythrin and models
6. C-H bond oxidation with copper complexes
7. Metallozeolites and metalloenzymes
8. Water splitting by cobalt catalysts
9. Activation of CO₂ by frustrated Lewis acid and base
10. C-H fluorination catalyzed by manganese porphyrin complexes
11. Iron-sulfur cluster – electron transfer center and synthetic models

12. Artificial photosynthetic systems inspired by photosystem II (PSII)
13. Nitric oxide sensing by transition metal complexes
14. Characterization of structure, metal environment, or function of a recently discovered metalloenzyme.
15. Engineering of a metalloprotein to tune or alter function
16. Development of metal-based imaging agents for medicine (MRI contrast agents or radiopharmaceuticals) or therapeutic radiopharmaceuticals.
17. Nitrogenase – protein and structural/functional models
18. Fluorescence sensing by lanthanide metal complexes
19. Gold nanoparticles for cancer thermal therapy
20. Copper and Alzheimer's Disease
21. Ring opening polymerization of lactide by metal catalysts
22. CO₂ capture by ionic liquid systems
23. Catalytic oxidation of organic molecules by polyoxometalates
24. Methane generation catalyzed by Methyl-coenzyme M reductase
25. Potential anti-tumor application of metal-N-heterocyclic carbene complexes
26. Recovery of uranium by inorganic absorbents
27. Photodynamic therapy based on quantum dots
28. Light harvesting by synthetic chlorin systems
29. Metal complexes as drug-delivery systems
30. Transition metal signaling in biological systems

Exams **Exams (75 minutes)** dates are posted on the syllabus. Plan your schedule accordingly; these dates rarely change. These timed exams typically consist of short answer questions and questions requiring numerical work. If students missed a test with a suitable excuse (medical/family emergency), the value of the final exam will be 200 + 100 = 300 points. **There will be no make-up tests.**

Homework Assignment Homework problems are necessary to develop your mastery of material discussed in lecture. The homework assignments will be posted on Blackboard. **The electronic copy of your homework assignment won't be accepted.**

Policies **1. Attendance**

People who miss classes typically do poorly in this course. Do not be one of these people. **Three unexcused absences will result in a W grade.** It is the student's responsibility to obtain information covered during an absence.

2. Office Hours

This time is specifically set aside for you to ask me questions and receive help on course material. Use this time! If you cannot make the scheduled times, make another arrangement with me.

3. Regrade

All regrade requests should be made to the instructor **within two weeks** after the grades posted on Blackboard. When inquiring about a possible regrade, please do NOT make any marks on the item in question.

4. Academic Integrity Statement:

The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by

the Board of Trustees as Board Policy No 709 on February 10, 2010, and published in the Student Handbook. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

5. Disabilities Act Statement:

The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the UCA Office of Disability Services, 450-3613.

6. Building Emergency Plan Statement:

An Emergency Procedures Summary (EPS) for the building in which this class is held will be discussed during the first week of this course. EPS documents for most buildings on campus are available at <http://uca.edu/mysafety/bep/>. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

7. Title IX Disclosure

If a student discloses an act of sexual harassment, discrimination, assault, or other sexual misconduct to a faculty member (as it relates to "student-on-student" or "employee-on-student"), the faculty member cannot maintain complete confidentiality and is required to report the act and may be required to reveal the names of the parties involved. Any allegations made by a student may or may not trigger an investigation. Each situation differs and the obligation to conduct an investigation will depend on those specific set of circumstances. The determination to conduct an investigation will be made by the Title IX Coordinator. For further information, please visit: <https://uca.edu/titleix>.

Tentative Lecture and Exam Schedule

Date	Topic	Date	Topic
		Jan 11 (Th)	Ch 1. Atomic structure
Jan 16 (T)	Ch 2. Molecular structure and bonding	Jan 18 (Th)	
Jan 23 (T)	Ch 4. Acids and bases	Jan 25 (Th)	Ch 5. Oxidation and reduction
Jan 30 (T)	Ch 6. Molecular symmetry	Feb 1 (Th)	
Feb 6 (T)		Feb 8 (Th)	Exam 1
Feb 13 (T)	Ch 7. Coordination Chemistry	Feb 15 (Th)	
Feb 20 (T)		Feb 22 (Th)	

Feb 27 (T)		Mar 1 (Th)	Ch 8. Physical techniques in inorganic chemistry
Mar 6 (T)		Mar 8 (Th)	
Mar 13 (T)	Exam 2	Mar 15 (Th)	Ch 27. Bioinorganic Chemistry
Mar 20 (T)	Spring Break	Mar 22 (Th)	Spring Break
Mar 27 (T)		Mar 29 (Th)	
Apr 3 (T)		Apr 5 (Th)	
Apr 10 (T)		Apr 12 (Th)	Presentation (1)
Apr 17 (T)	Presentation (2-5)	Apr 19 (Th)	Presentation (6-9)
Apr 24 (T)	Presentation (10-13)	Apr 26 (Th)	Presentation (14-17)
May 1 (T)	No class	May 3 (Th)	8:00am-10:00am Final Exam