

# Advanced Inorganic Chemistry

## Chem 4380, Spring 2017

**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 (5<sup>th</sup> Ed.)* by Shriver & Atkins, Macmillan Higher Education, 2009

<b>Grading</b>	<b>Possible points</b>
Individual presentation	200
Homework (20 pts each)	150
Two Exams (125 pts each)	250
Final exam (May 4, 8:00-10:00 am)	200
<b>TOTAL POSSIBLE</b>	<b>800</b>

**Grades: A = 720 – 800 points**

**B = 640 – 719.99**

**C = 560 – 639.99**

**D = 480 – 559.99**

**F < 600**

**Important Dates**  
Mar. 27 Last day to drop a course with a W  
Apr. 14 Last day to withdraw with a WP or WF

**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. Introduction to organometallic compounds and their catalysis of important organic transformations. 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 20 minutes individual oral presentation (15 minutes talk and 5 minutes questions). The whole presentation (including preparation) will be 200 points.

### **Guidelines:**

1. Select **ONE** of the topics listed on page 3 to prepare your presentation. You have two weeks (Jan. 12 – Jan. 27) to decide which topic you want to take. Please let me know the topic you want before **5:00 pm of Jan. 27 (Friday)**. If two students picked the same topic, first come first service. Then we will draw straws to determine the order of the presentations.

2. Once the topic is selected, the student and the instructor will meet **before**

**5:00 pm of Feb. 3 (Friday)** to discuss about 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 17 (Friday)**, students need to show me the **draft** of the presentation (**20 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 18, the student needs to practice no later than April 11.

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 new questions/problems have to be answered/solved 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 200 pts. It contains four parts:

Part 1 (20 pts): Draft of your presentation before 5:00 pm of **March 17 (Friday)**.

Part 2 (30 pts): Practice presentation **ONE** week before the formal presentation.

Part 3 (100 pts): Your presentation graded by 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 (50 pts): Your constructive comments for other speakers.

Your constructive comments/feedback for the eleven 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 50 pts/10 = 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 (2 pts/each criterion).

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  $Cu_A$  site in copper-containing enzymes
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. Nitrous oxide ( $N_2O$ ) activation by transition metal complexes
8. Water splitting by cobalt catalysts
9. Activation of  $CO_2$  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

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  $200 + 125 = 325$  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 WF 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 12 (Th)	Ch 1. Atomic structure
Jan 17 (T)	Ch 2. Molecular structure and bonding	Jan 19 (Th)	
Jan 24 (T)	Ch 4. Acids and bases	Jan 26 (Th)	Ch 5. Oxidation and reduction
Jan 31 (T)	Ch 6. Molecular symmetry	Feb 2 (Th)	
Feb 7 (T)		Feb 9 (Th)	<b>Exam 1</b>
Feb 14 (T)	Ch 7. Coordination Chemistry	Feb 16 (Th)	
Feb 21 (T)		Feb 23 (Th)	
Feb 28 (T)		Mar 2 (Th)	Ch 8. Physical techniques in inorganic chemistry
Mar 7 (T)		Mar 9 (Th)	
Mar 14 (T)	<b>Exam 2</b>	Mar 16 (Th)	Ch 27. Bioinorganic Chemistry
Mar 21 (T)	<b>Spring Break</b>	Mar 23 (Th)	<b>Spring Break</b>
Mar 28 (T)		Mar 30 (Th)	
Apr 4 (T)		Apr 6 (Th)	
Apr 11 (T)		Apr 13 (Th)	
Apr 18 (T)	Presentation	Apr 20 (Th)	Presentation
Apr 25 (T)	Presentation	Apr 27 (Th)	Presentation
May 2 (T)	No class	May 4 (Th)	<b>8:00am-10:00am Final Exam</b>