Fall 2014

Advanced Inorganic Chemistry 431

MW 3:00 – 4:15 PM
MADELEVA HALL 310
SAINT MARY'S COLLEGE

INSTRUCTOR

Kathryn L. Haas, Ph.D. (158 Science Hall, khaas@saintmarys.edu)

TEXTS, SUPPLIES

**Copies of these and other textbooks are available in my office and you are welcome to use them!
(1) Shriver and Atkins, *Inorganic Chemistry*, Fifth Edition, W. H. Freeman and Co., New York, 2010.
(2) Miessler, G.L. and Tarr, D.A. *Inorganic Chemistry*, Fourth Edition, Prentice Hall, UpperSaddle, NJ, 2011.
(3) Molecular Model Kits (*optional*)

INTRODUCTION

What makes inorganic elements special? In CHEM 431 we will cover most of the periodic table in some way or another, but we will focus on transition metal elements, or the d-block elements. The availability of d-orbital interactions is what gives metal ions interesting properties that are not usually observed with elements that you learned about in organic chemistry (C,N,O,H). Inorganic chemistry is a broad field, and we cannot possibly cover all of the potential topics in one course. We will learn about the physical properties that lead to the interesting behavior of inorganic elements. We will cover bonding, structure, magnetic and electronic properties, and reactivity of inorganic elements. After we learn the basics, we will have time to learn about the variety of subfields in inorganic chemistry.

We will cover much of the material found in both of the recommended textbook, however, we will not cover all the material presented in each chapter. It is most important for you to read the assigned material for understanding. I will let you know in advance what portions of the text you are responsible for, and I recommend you to pre-read the assigned text before I lecture on that material. Homework will be assigned for each chapter, both from the textbook and from sources that may require library work. The assigned problems will highlight the areas of each chapter I plan to emphasize on exams. Homework will be collected and graded. From your previous chemistry courses I will expect that you know the elementary details of the following: electronic and molecular structure including Lewis structures, hybridization of atomic orbitals, molecular orbital theory for diatomic molecules and VSEPR theory for the prediction of molecular shape; basic concepts of thermodynamics which include electrochemistry, acid-base equilibrium, solubility equilibrium, and the relationship between free energy, enthalpy and entropy; and basic concepts of kinetics and reaction mechanisms. If any of these topics seems unfamiliar to you, you might wish to review your freshman chemistry book.

EXAMS/ HOMEWORK/ GRADING

There will be three 75 min examinations and a final examination. There will be no make up exams. A student with a valid excuse for missing an exam will be permitted to use his/her final exam grade in lieu of the excused exam grade. A student who misses an exam without a valid excuse will receive a zero for that exam.
There will be at least 10 graded **homework assignments**, which are **due at the start of class each Monday**, unless otherwise indicated on the schedule. Homework will be accepted late until 6 AM the following day for half credit. Homework will not be accepted for a grade after 24 hours past the due date.

Hour Exam I:	September 17	100 points
Hour Exam II:	October 15	100 points
Hour Exam III:	November 24	100 points
Homework		200 points
Poster Assignment		100 points
Final ACS Exam:	Thursday, December 18 (4:15 PM)	300 points
TOTAL		900 points

Overall Grades for the course will be assigned approximately based on the following point totals.

Point Total	Grade
780-900	A-/A
650-779	B-/B+
500-649	C-/C+
450-499	D/D+
0-499	F

POSTER PRESENTATION ASSIGNMENT

Two lectures of the semester will be devoted to frontier topics in inorganic chemistry. You will be responsible for picking a topic and giving a poster presentation on that topic. Pick something you're really interested in! I need to approve your topic by October 28, 2013.

We will have two poster session days, each one with three 15 minute segments. Each person will present their poster for two of the 15 minute sessions. You should stand by your poster during your sessions, but during your "off" sessions, you should be learning about the topics on other posters.

You will be provided with evaluation forms for each poster session, and you should listen to and evaluate all of your classmates. The completed forms will become part of your grade for the overall poster project. You will be graded on two parts: (1) the content and organization of your poster and (2) your presentation of the poster. More details will come later in the semester.

BLACKBOARD

This course will use Blackboard for posting relevant course information and announcements. The COURSE MATERIALS section will include Exam Keys and Supplementary Course Materials. Weekly homework assignments will be posted in the ASSIGNMENTS section.

PRACTICE

Each student is responsible for the assigned homework problems each week. Although in-chapter practice exercises and end-of-chapter exercises and problems are not graded, they are very helpful. I recommend ALL in chapter practice and self-test problems, as well as end-of chapter exercises be completed.

ETIQUETTE/ ETHICS

Attendance will not be taken but it is requested that you arrive prior to the start of each lecture. Please turn all cell phones, mp3 players, and other electronic equipment off (not *vibrate*) before lecture begins each day. If you miss a lecture, you should seek out a classmate to provide you with notes or announcements from that class. **The course will be conducted according to the Saint Mary's Policy on Academic Honesty**. All students must familiarize themselves with the Policy on the College's website (http://www3.saintmarys.edu/first-year-policies) and pledge to observe its tenets in all written work, including exams and laboratory work. As a student you have a right to learn in an environment that provides for both intellectual and ethical growth. This is also your responsibility and requires you to behave in an ethical manner.

EMAIL POLICY

Prior to sending an email to me, please take a moment to review this syllabus or consult your classmates (if appropriate) as the answers to most administrative questions can usually be found with a short search. It is often difficult to answer questions regarding problem solving via email, so if you are able, please come to see me with such questions. That being said, I am happy to engage with students about course content, grades, or personal issues and do not wish to discourage open and frequent discussion via email. **Please allow 24 business hours while awaiting a reply.**

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Any student who, because of a disability, is eligible for accommodations to complete the requirements and expectations of this course is invited to contact Iris Giamo, in the Disability Resource Office located in Madeleva Hall Room 103C (x4262) or e-mail igiamo@saintmarys.edu for an appointment to review documentation and arrange for appropriate and legal accommodations. Students who suspect they may have a disability are also encouraged to contact the Disabilities Resource Office.

SUPPORT

Review Sessions. An evening review session will be held before each hour examination.

Office Hours. My office hours schedule is available for you to schedule appointments with me. Please make an appointment 24 hours in advance using Google Appointments at the link provided on your blackboard site. (Go to "Contact Kathryn Haas" and then "Make an Appointment"). 15-minute time slots are the default. Please be on time and if you need more than 15 minutes, schedule more than 1 block. **Please schedule appointments at least 24 hours in advance** to guarantee that I will be able to meet you, and give me notice if you must cancel an appointment. Please be courteous and do not abuse this system. (Abuse = arriving late or not showing up for scheduled appointments more than twice, blocking off unnecessarily excessive time, or scheduling meetings with less than sufficient 24-hour notice) Please remember that you are not the only student demanding my time, and thank you in advance for being responsible and courteous!

TOPICS

A *tentative* schedule of scheduled topics is shown below. More specific pre-reading sections will be assigned at the end of each lecture.

Week	Date	#	Topic	Bolded assignment due before next class period.
1	M 8/25 W 8/27	1 2	Introduction, Review of A.O. Theory Periodic Trends	Read Syllabus. *Follow-Up on* ***What is Inorganic Chemistry? Due 8/27*** Reading and problems in SA Ch 1 & 9.1-9.2 and MT Ch 1-2 **Problem Set 1 Due 9/1**
2	M 9/1 W 9/3	3 4	Structure, Bonding, Symmetry (M.O. Theory, Operations, Point Groups)	Reading and problems in SA Ch 2.1-2.7 & 6.1-6.2 and MT Ch 3.1-3.3 & 4.1-4.2, **Problem Set 2 Due 9/3**
3	M 9/8 W 9/10	5 6	Structure, Bonding, Symmetry (Applications, SALCS, MO Theory)	Reading and problems in SA 2.7-2.11 & 6.6-6.10 and MT Ch 4.3 & Ch 5, **Problem Set 3 Due 9/15**
4	M 9/15 W 9/17	7 E1	Vibrational spectroscopy **Exam 1**	Reading and problems in SA 6.3-6.5 and MT Ch 4.4 **Problem Set 4 Due 9/22**
5	M 9/22 W 9/24	8 9	Acids and Bases, CCI (Structures and Isomers)	Reading and problems in SA Ch 4 & 7.1-7.11 and MT Ch 6 & 9, **Problem Set 5 Due 9/29**
6	M 9/29 W 10/1	10 11	CC II & III (Field Theories, Electronic Structure and Properties)	Reading and Problems in SA 20.1-20.2 and MT Ch 10 **Problem Set 6 Due 10/6**
7	M 10/6 W 10/8	12 13	Coordination Chemistry IIV & V (Spectroscopic and Magnetic Properties)	Reading and problems in SA Ch 20.3-20.7 and MT Ch 11 **Problem Set 7 Due 10/13**
8	M 10/13 W10/15	14 E2	**Library research** **Exam 2**	
9	Fall Break! No class		Review and use this time wisely!	
10	M 10/27 W10/29	25 26	CC VI Thermodynamics, Kinetics, Mechanisms, Redox	Reading and problems in Chapter 7.12-7.15 and Chapter 5, Chapter 21, **Poster Topic Due 10/29. Problem Set 8 Due 11/3**
11	M 11/3 W11/5	28 29	Organometallics (18 e- rule, bonding and catalysis)	Reading and Problems in Chapter 22
12	M 11/10 W 11/12	31 32	Organometallic Catalysis, Bioinorganic Chemistry	Reading and Problems in Chapter 26 **Problem Set 9 Due 11/17**
13	M 11/17 W11/19	34 35	Bioinorganic Chemistry	Reading and Problems in Chapter 27 **Problem Set 10 Due 11/24**
14	M 11/24	37	**Exam 3**	
	W11/26 F 11/28	No Class! Thanksgiving	Review and use this time wisely!	
15	M 12/1 W12/3	40 41	Solid State, Materials	**Final E-copy of Poster Due 12/5 in Google Drive.** **Poster Hard Copy Due 12/8 at noon.**
16	M 12/8 W 12/10	43 44	Poster Session 12/8 Discussion and Review	
FE	**Final Exam: Thursday, December 18 4:15 PM**			

The instructor reserves the right to make changes to the syllabus and course schedule as the term proceeds.