

# CH 807: Chemistry of the Transition Elements

Fall 2008

Instructor: Professor Julia Brumaghim

Time/Location: 8:00 – 9:15 am Tuesday/Thursday, 470 Hunter Laboratories; please wait at least fifteen minutes if I am not present at 8:00

Text: Inorganic Chemistry, 4<sup>th</sup> Edition by James E. Huheey, Ellen A. Keiter, and Richard L. Keiter, Harper Collins, 1993

Office hours: In 203 Hunter on Mondays 2 – 4 pm, immediately after class, or by appointment

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## COURSE OBJECTIVES

This course is intended to provide sufficient background knowledge of the topics and techniques used in transition metal chemistry so that students should be able to (1) understand the important aspects of transition metal chemistry including the relevance of the topics listed on p. 2 to the field, (2) understand and critically evaluate the current literature in this field.

## COURSE SPECIFICS

### Reading

Appropriate reading from the text is given in the course outline (p. 2); *it is highly recommended that the reading be completed prior to the lecture for which it is assigned.*

### Problem sets

Problem sets are due *at the beginning of class* on the indicated days (p. 2), since answer keys will be handed out during the same lecture. No late homework will be accepted without a valid excuse.

### Exams

The midterm and final exam dates are listed on p. 2. The final exam will focus *primarily* on material from the second half of the course. Make-up exams will be given by appointment for excused absences only.

### Review paper

A review paper in the format of an *Angewandte Chemie* research highlight is required. A recent paper from the inorganic chemistry literature should be selected as the focus of your paper and the topic must be approved by 23 October.

### Grading

Grades will be based upon the midterm and final exams as well as the problem sets and the review paper. Final grades will be calculated using the percentages listed below and exams will be graded so that A: 100-90%, B: 89-80%, C: 79-70%, D: 69-60%, F: <60 %.

Problem sets (8)	40 %
Midterm exam	20 %
Review paper	20 %
Final exam	20 %

## COURSE OUTLINE

<b>Date (day)</b>	<b>Topic</b>	<b>Reading</b>	<b>Assignments due</b>
21 Aug. (Th)	Introduction and history		
26 Aug. (T)	Atomic properties and ionic bonding	Chapter 4	
28 Aug. (Th)	Covalent bonding: VB and MO theories	Chapter 5	
2 Sept. (T)	Symmetry elements and point groups	Chapter 3	Problem set 1
4 Sept. (Th)	Irreducible representations		
9 Sept. (T)	Basic molecular orbitals	Chapter 5	Problem set 2
11 Sept. (Th)	Molecular structure (VSEPR)	Chapter 6	
16 Sept. (T)	Periodic trends and molecular forces	Chapters 8, 18	Problem set 3
18 Sept. (Th)	Hard-soft acid base theory	Chapter 9	
23 Sept. (T)	Structure of coordination compounds	Chapter 12	Problem set 4
25 Sept. (Th)	Geometric isomerism		
30 Sept. (T)	Review		
2 Oct. (Th)	<b>MIDTERM EXAM</b>		
7 Oct. (T)	Coordination complexes in biology		
9 Oct. (Th)	Bonding in coordination compounds	Chapter 11	
14 Oct. (T)	Crystal field theory		Problem set 5
16 Oct. (Th)	Molecular orbital theory		
21 Oct. (T)	Electronic spectra of complexes		
23 Oct. (Th)	Reactions of coordination compounds	Chapter 13	<b>Paper outline approved</b>
28 Oct. (T)	Kinetic vs. thermodynamic stability		Problem set 6
30 Oct. (Th)	Redox reactions and electron transfer		
4 Nov. (T)	<b>Fall Break</b>		
6 Nov. (Th)	Lanthanides and actinides	Chapter 14	Problem set 7
11 Nov. (T)	Solid state structures	Chapter 7	<b>Paper due</b>
13 Nov. (Th)	Solid state chemistry		
18 Nov. (T)	Organometallic chemistry	Chapter 15	
20 Nov. (Th)	<b>Thanksgiving</b>		
25 Nov. (T)	Organometallic ligands		<b>Peer reviews due</b>
27 Nov. (Th)	Reactions of organometallic compounds		
2 Dec. (T)	Organometallic catalysis		Problem set 8
4 Dec. (Th)	Review		<b>Revised paper due</b>
12 Dec. (F)	<b>FINAL EXAM</b> (7 – 10 pm)		