

CH 8070: Chemistry of the Transition Elements

Fall 2020

- Instructor: Professor Julia Brumaghim
- Time/Location: *For online instruction:* Synchronous online delivery from 8:00 – 9:15 am Tuesday/Thursday; see Canvas for Zoom links to course meetings and office hours. Please wait at least fifteen minutes if I am not present at 8:00 am
- For in-person instruction (if/when university approves it):* 470 Hunter Laboratories; please wait at least fifteen minutes if I am not present at 8:00 am
- Text: Inorganic Chemistry, 6th Ed. (2014) by Shriver, et al. (ISBN 978-0198757177)
Recommended for additional reading: Inorganic Chemistry, 4th Edition by J. E. Huheey, et al., Harper Collins, 1993
- Office hours: Virtually on Mondays 3 – 4 pm, immediately after class, or by appointment (see Canvas for scheduled office hour Zoom links)
- Contact information: Office: 481 Hunter (phone 656-0481); email: brumagh@clemson.edu
Note: I will not be having in-person meetings in my office this semester, so please email me if you need to set up a virtual appointment.

COURSE DELIVERY

Due to the COVID-19 pandemic, at least the first part of this course will be delivered entirely online. All course materials will be available through Canvas, and all problem sets and exams will be assigned and turned in online. Changes to the course syllabus may be made due to 1) changing circumstances for instruction (e.g., a national/state/university shutdown and a work-from-home order), 2) illness of the instructor, 3) other unforeseen circumstances that require modification of course delivery or content. Every attempt will be made to give students ample lead time and explanation for any syllabus changes.

In person class meetings will resume if/when Clemson University authorizes in-person classes and if/when this class can be located in a sufficiently large classroom space to allow for proper social distancing. Further details will be provided as the semester progresses.

Instructor pledge: It is my intent to provide as useful and interactive a course environment as possible given the situational and technological constraints on Clemson University course delivery this semester. I realize that this is not an ideal situation, for either the instructor or the students, and I will do my best to make this a memorable and useful course despite the circumstances.

Student expectations: This is a foundational graduate course in inorganic chemistry, and it will be fast paced, especially during the initial sections of the course. It is expected that students will:

- 1) **Attend all the course meeting times** (and office hours, if desired) as if this were an in-person course.
- 2) **Share video of yourself during the course meetings.** I do not care at all if you attend in your pajamas, eat or drink during the class, or have a background of purple ponies and rainbows. As long as you are not disruptive to the rest of the class, and I can see your face, I am fine with anything. I will have a computer so that I can see all your video feeds when I teach. I do this because the visual feedback is very helpful for me to see who is understanding the material and who seems confused. Please help me with this.
- 3) **Make a conscientious effort to participate in the course discussions and ask/answer questions.** When taking an online course, there is a tendency to simply sit back and watch the instructor. This is not how I teach, and you will learn a lot less with this attitude. If you do this regularly, be advised that I will call on you by name to answer questions (I am persistent like that when it comes to getting students to participate and learn).

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) describe the important aspects of transition metal chemistry including the relevance of the topics listed on p. 2 to the field, and to (2) critically evaluate the current literature in this field. You will also be expected to understand educational aspects of critical thinking and how they apply to teaching, learning, and doing science.

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 provided during the same class. 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 and outline must be approved by 22 October. Historically, plagiarism from published works has been a particular problem in this assignment. ***Plagiarism outside this course can mean the end to a scientific career for both students and their advisors, and therefore it will not be tolerated in this course.***

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%, F: <70 %. No extra credit assignments will be accepted for this course.

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

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who need them. Students are encouraged to contact Student Accessibility Services to discuss their individual needs for accommodation. Attendance in this course is required.

In the event of illness

If I become ill during the semester, I will make every effort to notify you and continue teaching this course as I am able. If I am not able to teach this course, then Dr. Colin McMillen, the department crystallographer who has taken and taught sections of this course previously, will take over my teaching duties.

If you become ill during the semester, especially if it is with COVID-19, I recognize that this may be a longer-term illness that may hinder your participation in this course. If possible, notify me of your illness (and also notify your other instructors). If you are feeling sufficiently well, contact me and we will make a plan for you to continue your coursework online and make up any missed material or assignments.

Clemson guidelines for students: A student who tests positive or is being asked to quarantine/isolate because of exposure to the virus should inform the instructor that they will be moving to online-only instruction for at least the next two weeks. Students should use the Notification of Absence module in Canvas to notify the instructor. Additional communication via email is encouraged; students should follow up with their instructor to develop a continued plan of study for each course. Students cannot be penalized for needing to move to online instruction.

COURSE OUTLINE

<u>Date (day)</u>	<u>Topic</u>	<u>Reading</u>	<u>Assignments due</u>
20 Aug. (Th)	Introduction and atomic properties		
25 Aug. (T)	Atomic properties and ionic bonding	Chapters 1, 3	
27 Aug. (Th)	Molecular structure (VSEPR)	Chapter 2	
1 Sept. (T)	Covalent bonding: VB and MO theories	Chapter 2	Problem set 1
3 Sept. (Th)	Periodic trends and molecular forces	Chapter 9	
8 Sept. (T)	Hard-soft acid-base theory	Chapter 4	Problem set 2
10 Sept. (Th)	Symmetry elements and point groups	Chapter 6	
15 Sept. (T)	Irreducible representations		Problem set 3
17 Sept. (Th)	Basic molecular orbitals 1	Chapter 2	
22 Sept. (T)	Basic molecular orbitals 2		
24 Sept. (Th)	Structure of coordination compounds	Chapters 7, 8	
29 Sept. (T)	Geometric isomerism		Problem set 4
1 Oct. (Th)	Review		
6 Oct. (T)	MIDTERM EXAM		
8 Oct. (Th)	Coordination complexes in biology	Chapter 27	Paper assignment given
13 Oct. (T)	Bonding in coordination compounds	Chapter 20	
15 Oct. (Th)	Molecular orbital theory and diagrams		
20 Oct. (T)	Electronic spectra of complexes	Chapter 21	Problem set 5
22 Oct. (Th)	Reactions of coordination compounds		Paper outline approved
27 Oct. (T)	Kinetic vs. thermodynamic stability		
29 Oct. (Th)	Crystal field theory	Chapter 20	
3 Nov. (T)	Fall Break		
5 Nov. (Th)	Redox reactions and electron transfer	Chapters 5, 21	Paper due
10 Nov. (T)	Solid state structures	Chapters 3, 24	Problem set 6
12 Nov. (Th)	Solid state chemistry		
17 Nov. (T)	Lanthanides and actinides	Chapter 23	Problem set 7
19 Nov. (Th)	Nuclear chemistry		Peer reviews due
24 Nov. (T)	Organometallics	Chapter 22	
26 Nov. (Th)	Thanksgiving		
1 Dec. (T)	Catalysis	Chapter 26	Problem set 8
3 Dec. (Th)	Review		Revised paper due
11 Dec. (F)	FINAL EXAM (7:00 – 9:30 pm)		

Academic Integrity

Official Clemson statement: "As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form."

Our class statement: Academic dishonesty is very harmful both inside and outside of the university setting. It will benefit everyone, most importantly yourselves, to avoid this destructive habit. As a result, academic dishonesty, including but not limited to cheating and plagiarism, will not be tolerated in this class and will receive no credit.

Student Accessibility Services

It is university policy to provide, on a flexible and individualized basis, reasonable accommodations to students who require them. Students requesting accommodations should make an appointment with Accessibility Services (656-6848) to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Accessibility Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Clemson University Title IX Statement

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information, or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. The policy is located at <http://www.clemson.edu/campus-life/campus-services/access/non-discrimination-policy.html>. Alesia Smith serves as Clemson's Title IX Coordinator and may be reached at knightl@clemson.edu or (864) 656-3181.

Class Cancelation

If class is canceled due to inclement weather or other unforeseen circumstances, students will be responsible for turning in assigned work or being prepared for test or class assignments during the next class meeting period.