CHEM 511 – Inorganic Chemistry – Spring 2018
1:20 PM MWF, Chemistry Room 2373
Credits: 3

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Goals: This course will expose you to the basics of physical inorganic chemistry, giving you a theoretical framework to understand the structures, bonding, and reactions of inorganic compounds. We will apply the concepts of molecular symmetry and group theory to electronic and spectroscopic properties of inorganic compounds. Important sub-disciplines of inorganic chemistry will be introduced, such as coordination chemistry, solid-state chemistry, organometallic chemistry, and bioinorganic chemistry.

Collaboration: My goal is to create a *collaborative* learning environment for this course, rather than a *competitive* one. Working together with others toward a common goal is an important lifelong lesson for all of us. Towards this end, I encourage you to work collaboratively with your classmates on various aspects of the course material, including Problem Sets, Quizzes, and even Exams. I do not grade on a curve, so you are competing – not with each other – but against my absolute scale given on the next page.

Text: Miessler, G. L.; Tarr, D. A. *Inorganic Chemistry*, 5th ed.; Pearson Prentice Hall: Boston, 2014. *Mastery of the material in Chapter 3 of this book is assumed at the outset of the course. This includes simple bonding theory and VSEPR theory. You may want to review this chapter.*

Email: Feel free to contact me via email if you have questions or comments about the course or the work you are doing. I try to respond to all messages either directly by email or, when appropriate, in the next lecture. Please write "CHEM 511" in the subject line when you write to me.

Problem Sets: Problem sets will be given to supplement suggested homework problems from the textbook. The problem sets are worth 15 points each. It is your responsibility to compare your answers to the solutions and talk with me if you do not understand how to arrive at the correct answer for each problem. I recommend that you work the suggested problems together with your classmates as soon as possible after the associated class period.

Quizzes: Objectives will be provided in advance for each in-class quiz. You will choose a partner for each quiz, and you may not have the same partner twice. The quizzes will be given starting February 2nd as noted on the schedule. Quizzes are designed to assess your skill in applying the tools taught in class and will take no more than 10 minutes to complete. Quizzes are worth 10 points each. Your lowest quiz score will be dropped.

Exams: There will be two mid-term exams and a final exam. They will be take-home exams. Due dates for the midterm exams are Wednesday, Feb. 28th and Thursday, April 18th. The final exam is due Monday, May 7th. The final exam will stress topics from the last third of the course, although mastery of the tools from the rest of the course is expected. Exam objectives will be made available to help you prepare for each exam. As with other aspects of the course, you are encouraged to work together to complete these exams.

Greenhouse Gas Project: You and three classmates will be assigned to a group to investigate the properties of a specific greenhouse gas. Groups will be determined on Friday, Feb. 9th, and your group should choose which molecule to study by Friday, Feb. 16th. This project is due in final form on Monday, March 12th.

Grades: Your grade for the course will be based on a maximum of 600 points for the class as follows:

Exam 1:	100 points
Exam 2:	100 points
Final Exam:	150 points
Problem Sets:	150 points
Quizzes:	50 points
Project:	50 points
Total:	600 points

Final grades are on an absolute scale. If you earn 585 points, you are guaranteed an A. Likewise for the other point totals. You are competing against this scale, and not other students. It is therefore to your benefit to help each other.

A	540 – 600 points	(90 %)
AB	526 – 539 points	(87.7 %)
B	480 – 525 points	(80 %)
BC	466 – 479 points	(77.7 %)
C	420 – 465 points	(70 %)
D	360 – 419 points	(60 %)
F	< 360 points	(< 60 %)

The grade cutoffs may be adjusted downward at the end of the semester, but they will never be adjusted upward.

Learning Support and Special Conditions: If you have any special needs, please make an appointment to speak to me at your earliest convenience. If you are unable to attend class because of an unavoidable schedule conflict, for example a religious observance, athletic activities, or a family obligation, please contact me to make up any missed work (e.g., an in-class quiz). If circumstances arise unexpectedly that preclude your taking an exam, please contact me before the scheduled exam time. I recognize that in an emergency situation, you may not be able to contact me in a timely way.

Schedule of Topics, Reading Assignments, Suggested Problems, and Assignment Due Dates
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Week	Day	Date	Topic	Chapter	Suggested Problems	Problem Set Due	Quiz
1	W	24.1.2018	Introduction & Symmetry	4	Find symmetry elements in everyday objects		
	F	26.1.2018	Symmetry Elements & Symmetry Operations	4	Ch. 4: 7, 8		
2	M	29.1.2018	Point Groups	4	Ch. 4: 1, 2, 3, 4		
	W	31.1.2018	More Point Groups & Molecular Symmetry	4	Ch. 4: 5, 6		
	F	2.2.2018	Group Theory, Character Tables, and Representations	4	Ch. 4: 20,21		1
3	M	5.2.2016	Reducible Representations	4	Ch. 4: 22, 23		
	W	7.2.2016	Applications of Symmetry	4	Ch. 4: 24, 30, 31		
	F	9.2.2016	Electron-electron interactions and shielding	2	Ch. 2: 9,10, 12, 23	1	
4	M	12.2.2016	Periodic Trends	2	Ch. 2: 29, 31, 39, 42		
	W	14.2.2016	Molecular Orbital Theory for Homonuclear Diatomics	5	Ch. 5: 4, 5		
	F	16.2.2016	Heteronuclear Diatomics and Triatomics	5	Ch. 5: 7, 8		2
5	M	19.2.2016	Group Orbitals for more Complex Molecules	5	Ch. 5: 14, 19		
	W	21.2.2016	Making and Interpreting MO Diagrams	5	Ch. 5: 20, 35		
	F	23.2.2016	Frontier Orbitals and Molecular Properties	5	Ch. 5: 30, 31		
6	M	26.2.2016	Inorganic Solids, Close Packing	7	Ch. 7: 5,6	2	
	W	28.2.2016	Ionic Structures Based on Close Packing	7	Ch. 7: 3; ***EXAM 1 Due***		
	F	2.3.2016	Lattice Energy, Band Structure	7	Ch. 7: 16, 17		
7	M	5.3.2016	Coordination Chemistry – Definitions and Nomenclature	9	Ch. 9: 4, 7		
	W	7.3.2016	Structures and Isomers of Coordination Compounds	9	Ch. 9: 12, 17		3
	F	9.3.2016	More Structures and Isomers of Coordination Compounds	9	Ch. 9: 19, 20, 21	3	
8	M	12.3.2016	Stability and Magnetic Properties of Coordination Compounds	9,10	Ch. 10: 4, 6		
	W	14.3.2016	Ligand Field Theory 1	10	Ch. 10: 8, 23		
	F	16.3.2016	Ligand Field Theory 2	10	Ch. 10: 19, 20		

9	M	19.3.2016	Ligand Field Theory 3	10	Ch. 10: 17		
	W	21.3.2016	Spectroscopic Term Symbols	11	Ch. 11: 1, 7		4
	F	23.3.2016	Orgel Diagrams	11	Ch. 11: 11,16		
10	NO CLASS – SPRING BREAK						
11	M	2.4.2016	Tanabe-Sugano Diagrams	11	Ch. 11: 14, 15		
	W	4.4.2016	Metal-Metal Multiple Bonding	15.3.1	Ch. 15: 15, 16, 18	4	
	F	6.4.2016	Substitution Reactions of Coordination Compounds	12	Ch. 12: 3, 5		
12	M	9.4.2016	Mechanisms of Substitution	12	Ch. 12: 6, 11		
	W	11.4.2016	Redox Reactions of Coordination Compounds	12	Ch. 12: 19, 20		
	F	13.4.2016	Organometallic Compounds and the 18 Electron Rule	13	Ch. 13: 1, 2, 3		
13	M	16.4.2016	Cyclic π Ligands	13	Ch. 13: 10, 15	5	
	W	18.4.2016	Molecular Orbital Theory for Organometallic Compounds	13	Ch. 13: 15, 18; ***EXAM 2 Due***		
	F	20.4.2016	Carbene and Carbyne Complexes	13	Ch. 13: 41		
14	M	23.4.2016	Oxidative Addition and Reductive Elimination	14	Ch. 14: 1b, 3f, 3g		5
	W	25.4.2016	Insertions/Migrations	14	Ch. 14: 13, 14		
	F	27.4.2016	Important Industrial Catalysts and Processes	14	Ch. 14: 23, 32		
15	M	30.4.2016	Metals in Biology: The Mineral Nutrients	16	TBA		
	W	2.5.2016	Chemistry of Metal Cofactors	16	TBA	6	
	F	4.5.2016	Metals in Medicine	16	TBA		6
*** FINAL EXAM: Due May 7th***							