

Chemistry 425: Inorganic Chemistry I
Fall 2020

Instructor: Matt Cain

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Office Hours: MTWRF 8:00-9:00 am or by appointment, Bilger 321C

Text:

Inorganic Chemistry, 5th Edition, Miessler and Tarr

Other useful textbooks:

Organometallics, 3rd Edition, Elschenbroich

The Organometallic Chemistry of the Transition Metals, 6th Edition, Crabtree

Grading:

4-5 Exams, ~100 pts each

EACH EXAM IS APPROXIMATELY 2 HOURS. EXAMS WILL BE GIVEN IN-PERSON. YOU WILL HAVE TO FIND A 2 HOUR BLOCK DURING THE DAY TO TAKE THE EXAM. I HAVE ACCESS TO 2 DIFFERENT LABS THAT CAN BE EFFECTIVELY "SOCIAALLY DISTANCED" SO PEOPLE CAN TAKE THE EXAM IN A SAFE MANNER.

HW and assignments → 10-20 pts each (drop lowest) = 1 Exam (of lowest points)

Topics/Chapters:

Chapter 9: Coordination Chemistry I: Structures and Isomers

History, Nomenclature, Isomerism, Coordination Numbers and Structures, MOFs, Counterions, terminology and concepts

Chapter 10: Coordination Chemistry II: Bonding

Evidence for electronic structures, crystal field theory, ligand field theory, angular overlap, Jahn-Teller Effect

Chapter 11: Coordination Chemistry III: Electronic Spectra

Absorption of Light, Quantum numbers of multielectron atoms, electronic spectra of coordination compounds

Chapter 12: Coordination Chemistry IV: Reactions and Mechanisms

Background, Substitution Reactions, Kinetic Consequences of Reaction Pathways, Experimental Evidence of Octahedral Substitution, Stereochemistry of Reactions, Substitution reactions of Square Planar Complexes, trans effect, ox-red reactions

Chapter 6: Acid-Base and Donor-Acceptor Chemistry

Arrhenius Concepts, Bronsted-Lowry, Lewis Acid-Base, Intermolecular Forces, HSAB Theory

Chapter 13: Organometallic Chemistry

Background, organic ligands, 18-electron rule, ligands, bonding between metal atoms and π -systems, M-C bonds, spectral analysis

Chapter 14: Organometallic Reactions and Catalysis

Chapter 15 (Time-Permitting): Parallels between Main Group and Organometallic Chemistry

Isolobal analogy and its significance

Additional Topics: *Introductory Main Group Chemistry, Tools in Organometallic Chemistry, Multinuclear NMR analysis, Chirality*

Suggestions:

Come to class. I will not take attendance or give pop quizzes, but coming to class will be critical to doing well in the class. I may say things like "You need to know this," i.e., this is probably going to be on the exam. You are adults, and I will treat you as such. Come to class, do your work, and you will do fine. If you cannot do the minimum of showing up, I will have no sympathy for you.

I will mostly shuttle between powerpoint slides and the blackboard. Therefore, I would print out the powerpoint slides (perhaps 4-6 to a page if you want to save paper/ink) and write on them. Having paper handy will also make it quick and easy to write with me as I discuss concepts on the blackboard.

You may notice that on my powerpoint slides, I cite an extensive amount of published research. You DO NOT need to read these papers, but you may be interested in the chemistry and therefore, I am providing you an excellent, often recent source to explore. If you want to read the papers, by all means read, this is how you learn, and there is an abundance of extremely smart and creative chemists out there that you should know.