Chemistry 730
Coordination and Organometallic Chemistry
Fall 2017

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Time: 11:00-12:15 TTh Malott 3059

This course covers fundamental aspects of chemical bonding, group theory, coordination, organometallic, and bioinorganic chemistry.

Office Hours: Open door policy, but it often helps to touch bases beforehand.


Assignments: Reading assignments will include chapters from the texts and other assignments, such as journal articles, seminars, web-sites.

Problem sets will be given to support lectures, usually in conjunction with text chapters. They will be collected and will be due (handed in) approximately one week after material is covered in class (specific dates will be announced during lectures).

Grading: Problem Sets: 10% of grade - Graded on a scale of 1 - 10 based on 10 being perfect. Homework should be neatly handwritten (or typed), with all work and reasoning shown. DO NOT hand in homework that is torn from notebooks with spiral edges nor homework that is not neatly stapled. Homework handed in late will result in grade reduction depending on degree of lateness, and homework not handed in will result in a grade of zero for that problem set. Sloppy, hard to read homework may be returned without grading or at the very least points will be deducted.

Three in-class exams: 20% each (dates and times TBA). Exams will roughly align with the three parts of the course outlined below.

Final Exam: 30%. Students averaging above 90% on the three in-class exams will be given the option to be exempt from the final exam!

Important Notes: Helpful hints and material not in the text will be covered in the lectures. For this reason, it is expected that you attend lectures. Anyone caught cheating on any exam, or in handing in duplicate homework, will receive a zero for that work. The instructor reserves the right to report any incident of academic misconduct, including evidence of plagiarism.
Part I. Basic Bonding and Group Theory


Chapter 2: The Structure of the Atom. Review of orbital shapes and quantum numbers; orbital filling of electrons; the periodic table; shielding; and periodic properties. Problems: 2, 3, 6, 10, 19, 20, 23, 24.

Chapter 3: Symmetry and Group Theory. Description of symmetry elements, symmetry operations, and point groups; introduction to character tables and their uses. Problems 1-3, 9, 10, 15, 28, 29.


Chapter 6: Valence Shell Electron Pair Repulsion Theory. Quick review. You will be expected to know this for General Chemistry courses as a GTA.

Problems Chapters 5 and 6: Determine Lewis dot diagrams and predict the structure using VSEPR Theory for SiCl₄, OF₂, SCl₂, PbCl₂, TaCl₅, BrF₅⁺, In(CH₃)₃, BeCl₂, SbF₅⁻, PH₃, H₂O⁺, PCl₅, XeOF₄, N₂O, SF₄.


Chapter 8. Chemical Forces. van der Waals forces (London dispersion forces) and hydrogen bonding, and a comparison of the energies of the types of chemical forces. Quick review.

Part II. Coordination Chemistry.

Chapter 11: Bonding, Spectra, and Magnetism. Introduction to coordination chemistry including coordination numbers, ligands, nomenclature, crystal field and molecular orbital theories. Basic principles of electronic spectra and magnetism. Problems 1-4, 7, 8, 11, 12, 20, 21, 23, 24, 32, 35.

Chapter 12: Coordination Chemistry: Structure. A survey of coordination numbers and geometries, and descriptions of types of isomerism, the chelate and macrocyclic effects. Problems 1, 9, 10, 11, 12.


Part III. Organometallic Chemistry, Catalysis, and Bioinorganic Chemistry

Chapter 15. Organometallic Chemistry. The 18-electron rule, metal carbonyl complexes, carbon π-bonds, and other metal carbon compounds. Introduction to classes of catalytic reactions. Selected readings from Crabtree and assigned organometallic papers/reviews. Problems will be assigned later.

Chapter 19. Bioinorganic Chemistry – time permitting. A description of the importance of inorganic coordination chemistry in biological systems. Survey of different types of metalloproteins and metalloenzymes and their functions. Selected readings from papers/reviews will be assigned.