Prerequisites for Section VI (3 weeks)

Metal Chemistry; coordination complexes, clusters, and solids (3 weeks)

   a. Alkali and alkaline earth metals
   b. d-block metals — coordination complexes: ligands and geometries, isomerism, ligand field theory, magnetism, ligand substitution reactions, redox states, general periodic trends, π-donors, π-acceptors

   • Ligands are generally the “organic” part of coordination compounds. Since they are inevitably Lewis bases, you should refamiliarize yourself with range of Lewis basic compounds in organic chemistry. Most prominent are amines, imines, cyanides, and alkoxides — but ethers, alcohols, and other compounds bearing lone-pairs can serve as ligands too. Your ability to write down sensible-looking ligands depends on your ability to use fundamental bonding ideas (e.g., Lewis structures) to properly assign charges, locate lone-pairs, etc.

   c. Metal-metal bonded compounds
   d. e⁻ transfer reactions — inner and outer sphere mechanisms

   • This section will introduce important concepts concerning the extent to which a molecule must reorganize in the transition state and profound effect that reorganization energy plays in affecting the rate of electron transfer reactions. Before that discussion can be understood, you may need to review what you learned in P-Chem concerning transition state theory.
   • A centrally important equation from transition state theory, \( k = A e^{-\Delta G^\ddagger/RT} \), the rate constant \((k)\) for a reaction is related to the free energy of activation, \(\Delta G^\ddagger\).

   e. Organometallics — representative molecules and reactivity

   • Once again, your ability to write down sensible-looking organic fragments depends on your ability to use fundamental bonding ideas (Lewis structures, MOs of organic π-systems) to properly assign charges, locate lone-pairs, etc.

   f. Solid state chemistry of d-block compounds

Sources: Handouts, SA: Selections from Chapters 7, 9, 13, 14, 16