8.2: Crystal Field Theory

Learning objectives for this unit are to:

- Recall and draw shapes of common coordination complex geometries
- Describe Berry pseudorotation and explain the experimental evidence that supports interconversion of trigonal bipyramidal and square planar geometries
- Derive d-orbital splitting diagrams based on a given ligand field (coordination number and geometry)
- Calculate crystal field/ligand field stabilization energies (CFSE/LFSE) for a metal ion in octahedral and tetrahedral transition metal complexes
- Understand the difference between low and high spin complexes, determine the number of unpaired electrons for low-spin and high-spin configurations, and predict the spin state of a complex based on oxidation state and identity of the metal, identity of the ligands, and geometry of the complex.
- Predict whether a four-coordinate complex will be tetrahedral or square planar based on the metal d-electron count and the electronics and sterics of the ligands