8.8: Learning Objectives

After mastering the material covered in this chapter, one will be able to:

1. Describe the Orbital Approximation and explain how it leads to differences for polyelectronic atoms relative to the Hydrogen atom results.
2. Utilize the Aufbau principle to determine the ground electronic state electronic configuration for a polyelectronic atom, taking into account any important consequences of
    a. the Pauli Exclusion Principle
    b. Hund's Rules of Maximum Multiplicity
3. Construct an orbital diagram depicting an electronic configuration, including using such a diagram to predict important properties of the ground (or any) electronic state configuration of an atom. These properties may include
    a. Paramagnetism or diamagnetism
    b. Total spin multiplicity or the number of total spin multiplicities associated with a given electronic configuration.
4. Use Russell-Saunders angular momentum coupling to determine the term symbols that arise for a given electronic configuration. Especially, one should be able to predict the lowest-energy term-state that arises from an electronic configuration consistent with Hund's Rules.
5. Employ electron exchange symmetry rules to construct symmetry-adapted linear combinations of spin functions that can be used to satisfy the Pauli Exclusion Principle by creating total wavefunctions that are antisymmetric with respect to the exchange of equivalent electrons.
6. Construct energy-level diagrams for term states that are consistent with Russell-Saunders coupling and the Lande Interval Rule.
    a. Use these diagrams to predict the structure of electronic transition spectra involving these states.
    b. Organize the data into a Deslandres Table to aid in the conformation of assignments and the calculation of spin-orbit coupling constants.