Writing Electron Configurations

Bromfield Honors Chemistry

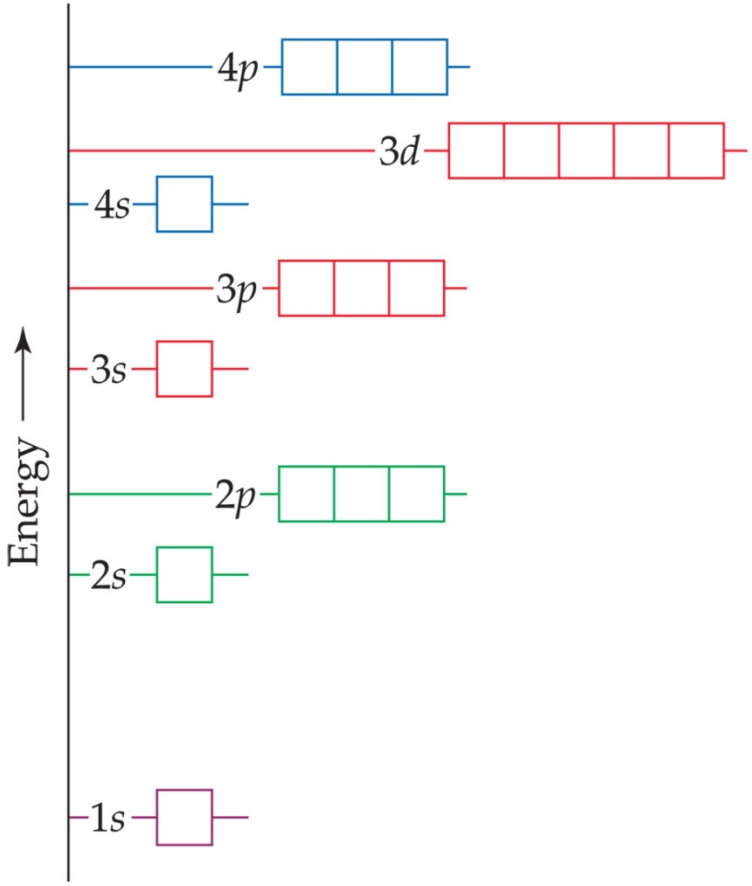
Objectives

- 3 rules for writing electron configurations
- 3 different formats for writing electron configurations
- Practice problems

Analogy

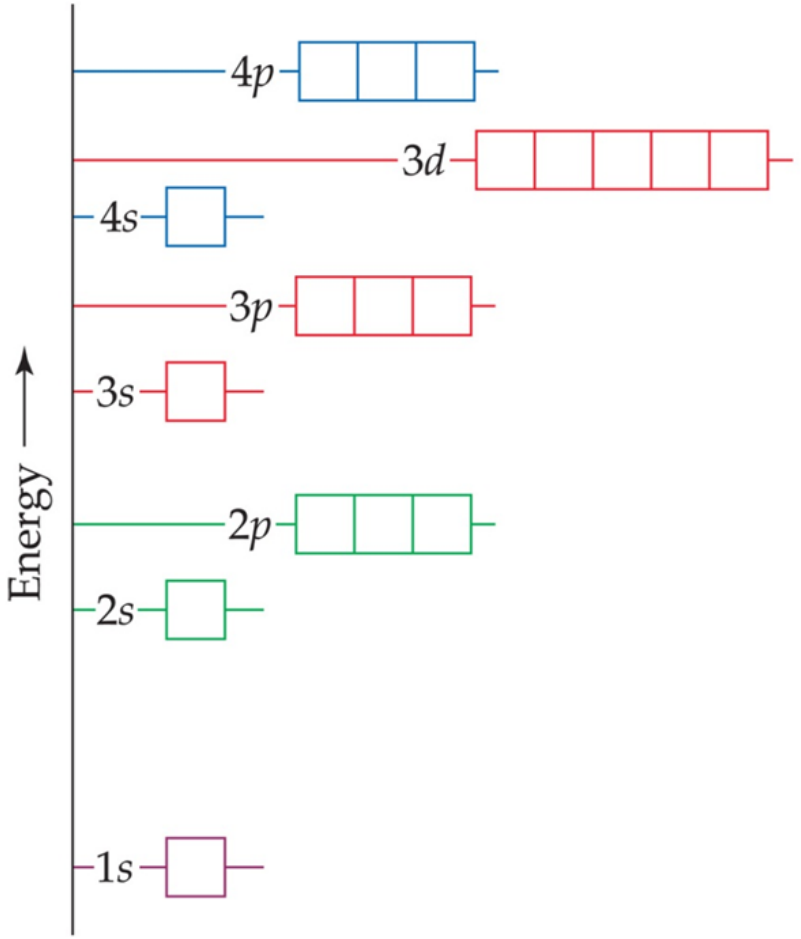
Aufbau principle

- Orbitals are filled in order of INCREASING energy



Aufbau principle

- Start with energy level 1
- Then energy level 2, and so on
- In general, s < p < d < f in the same energy level



Writing an e- config for H

- H has 1 electron
- Box notation:
  Arrows and boxes

- Spectroscopic
  notation

Pauli Exclusion Principle

- Version 1:

  No two electrons in the same atom can have identical sets of the 4 quantum numbers.

Pauli Exclusion Principle

- Version 2:

  Two electrons may occupy the same orbital, but they must have opposite spins.

Use both arrows& box notation and spectroscopic notation to write electron configurations for…

- Helium
- Beryllium
- Lithium
- Boron

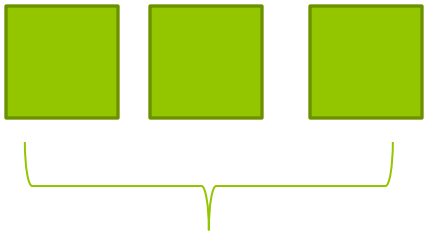
Hund's Rule

- Applies to p, d and f orbitals
  - "degenerate orbitals"—all the orbitals in the sublevel have the same energy

Friedrich Hund, in the 1920's

Hund's Rule

- For degenerate orbitals (i.e., p, d and f sublevels), place one electron in each orbital, all spin aligned, before pairing any electrons



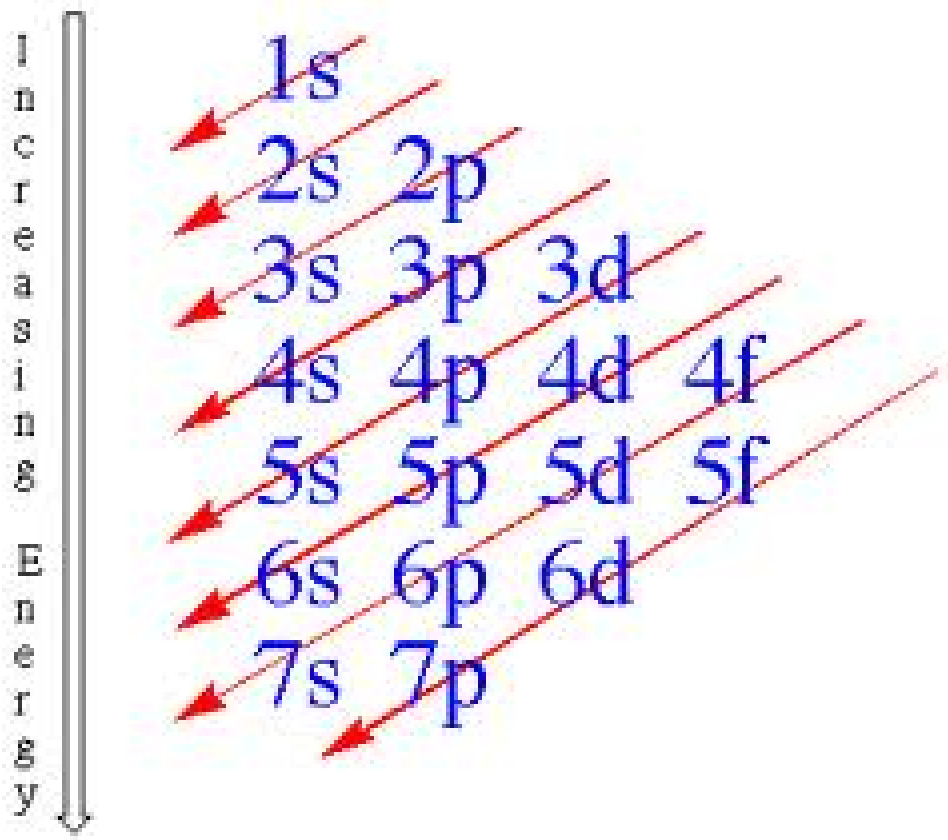
3p sublevel

Write electron configurations...

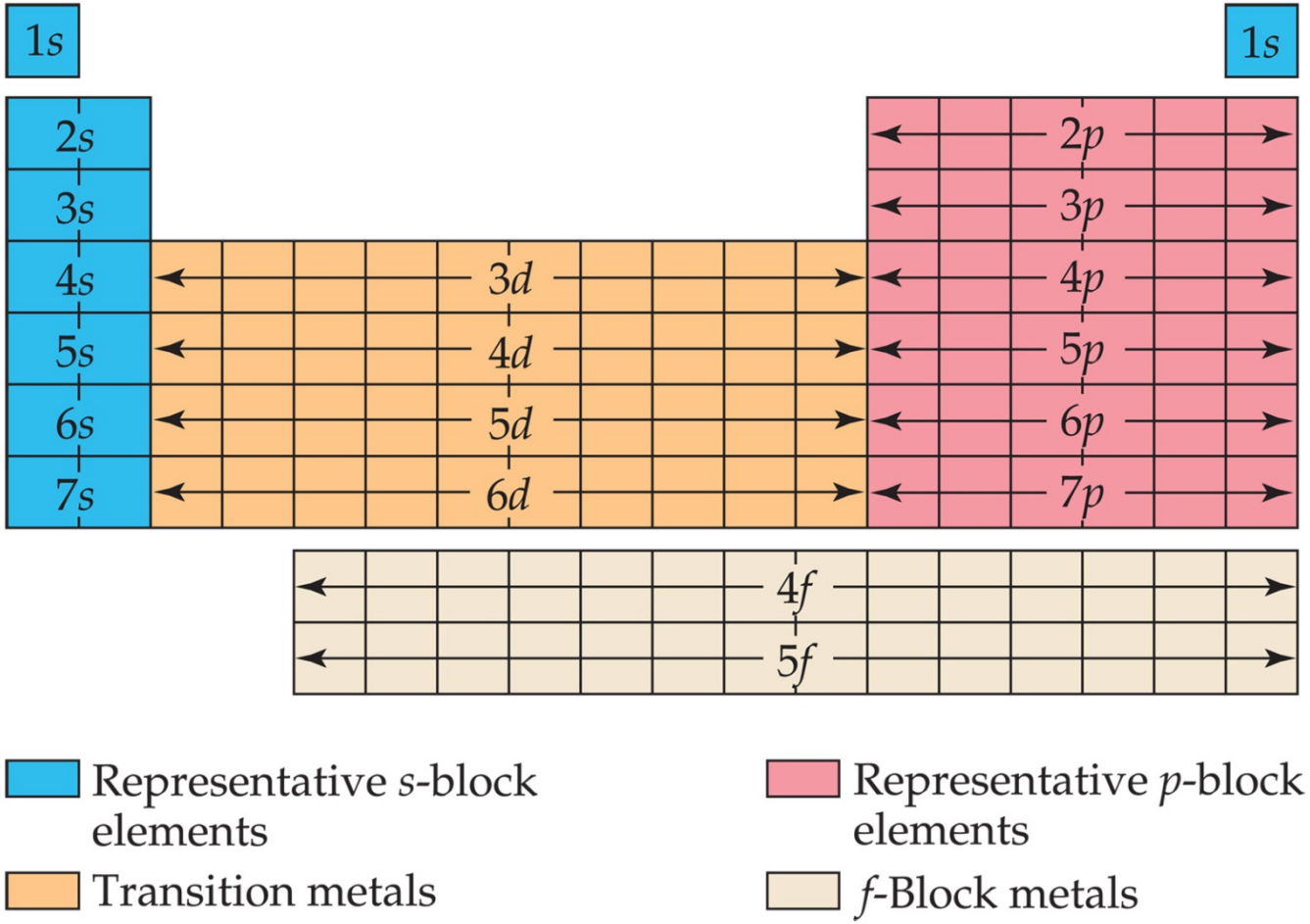
- Carbon
- Neon
- Nitrogen
- Chromium

Aufbau principle

- Mnemonic
  - After 3p, the filling sequence goes “out of order”



Use the periodic table…



3rd way…noble gas notation

- Use group 18 element to represent the inner ("core") electrons

- Ex. Carbon

  $[He]2s^2\ 2p^2$

Use noble gas notation to write electron configurations for…

- Magnesium
- Iodine
- Iron
- Lead

Valence electrons

- Ex. Carbon

  [He] $2s^2\ 2p^2$ ← 4 valence electrons

- Outermost s and p electrons (d electrons don't count as valence electrons)