13 • Electron Configurations
Electron Energy Levels
(1 of 4)

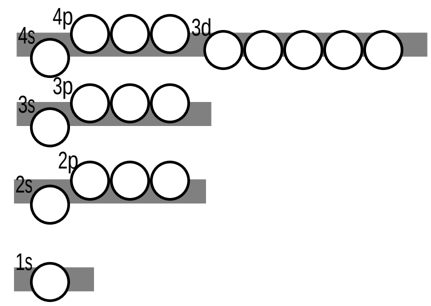
The electrons in an atom exist in various **energy levels.**

When an electron moves from a lower energy level to a higher energy level, energy is **absorbed** by the atom. When an electron moves from a higher to a lower energy level, energy is **released** (often as light).

Neils Bohr was able to determine the energy levels of **hydrogen** by the **visible light** energy that is **released** when the electron **drops** from 3 → 2 (red light), 4 → 2 (blue-green), 5 → 2 (blue-violet) and 6 → 2 (violet).

Transitions to level **n = 1** are too **high** energy to see (UV).

13 • Electron Configurations
Showing Electron Arrangments:
Orbital Diagrams and Electron Configurations
(2 of 4)



A shorthand notation is the **electron configuration**:

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6$, etc.

13 • Electron Configurations
Filling Orbitals
(3 of 4)

Three rules define how the orbitals fill:

The Pauli Exclusion Principle

Each orbital can be occupied by **no more than two** electrons.

The Aufbau Principle

The electrons occupy the **lowest energy orbitals** available. The "**Ground State"** for an atom is when every electron is in its **lowest** energy orbital.

Hund's Rule

When more than one orbital exists of the same energy (p, d, and f orbitals), place **one electron in each** orbital

13 • Electron Configurations
Valence Electrons
(4 of 4)

The **valence electrons** are the **outermost** electrons… those **farthest** from the nucleus. They have the **largest** principal quantum number, **n**.

These electrons occupy the **s** and **p orbitals** in the **highest energy level**. These orbitals are called the **valence orbitals**.

The **columns** of the periodic table are **labeled**, I, II, III, IV, V, VI, VII and VIII (ignoring the transition and rare earth elements). This label tell you the **number of valence electrons** of every element in that column (except He.)

The valence electrons are important in how atoms **bond**.