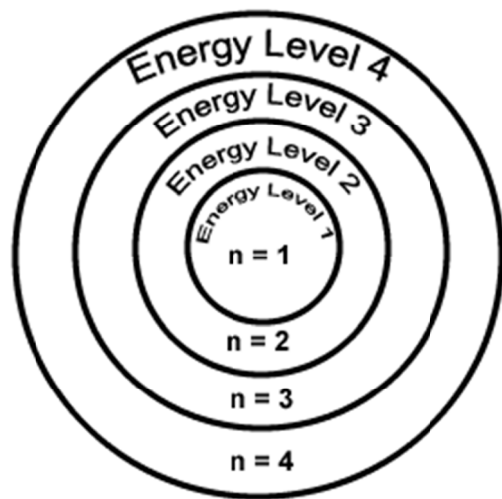


## Electron Orbitals

**Quantum Numbers** specify the properties of atomic orbitals and the properties of the electrons in orbitals

**Orbitals** are regions inside an energy level where the probability of finding an electron is very high.

Principal Quantum Number ( $n$ ), indicates the main energy level occupied by the electron. Values of  $n$  are positive integers, where  $n=1$  is closest to the nucleus, and lowest in energy.



Principal Quantum Number ( $n$ )	Sublevels in main energy level ( $n$ sublevels)	Number of orbitals ( $n^2$ )	Number of electrons per sublevel	Number of electrons per main energy level ( $2n^2$ )
1	s	1	2	2
2	s p	1 3	2 6	8
3	s p d	1 3 5	2 6 10	18
4	s p d f	1 3 5 7	2 6 10 14	32

## Electron Configurations

1. Aufbau Principle
  - a. An electron occupies the lowest-energy orbital that can receive it
2. Hund's Rule
  - a. Orbitals of equal energy are each occupied by one electron before any orbital is occupied by a second electron, and all electrons in singly occupied orbitals must have the same spin
3. Octet
  - a. Highest energy level  $s$  and  $p$  electrons are filled (8 electrons)
  - b. Characteristic of noble gases, Group 18
4. Noble gas configuration
  - a. Outer main energy level fully occupied, usually (except for He) by eight electrons
  - b. This configuration has extra stability

Element	Configuration notation	Orbital notation
Hydrogen		$\overline{1s}$
Helium		$\overline{1s}$
Lithium		$\overline{1s} \quad \overline{2s}$
Beryllium		$\overline{1s} \quad \overline{2s}$
Boron		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Carbon		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Nitrogen		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Oxygen		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Fluorine		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Neon		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---}$
Sodium		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---} \quad \overline{3s}$
Magnesium		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---} \quad \overline{3s}$
Aluminum		$\overline{1s} \quad \overline{2s} \quad \text{---} \quad \overline{2p} \quad \text{---} \quad \overline{3s} \quad \text{---} \quad \overline{3p} \quad \text{---}$