

ORBITALS

S orbital: spherical shape

P orbital: dumbbell shape

D orbital: 4-leaf clover shape

F orbital: asterik symbol (3 intersecting lines)

QUANTUM MECHANICS

- When an electron falls from a higher-energy outer shell orbital to a lower-energy inner shell orbital, it emits electromagnetic energy whose frequency corresponds to the energy difference between the orbitals

- The different spectral series correspond to electronic transitions from outer shell orbitals to different inner shell orbitals

m: shell the transition is to (inner shell)

n: shell the transition is from (outer shell)

ELECTRON SPIN AND THE PAULI EXCLUSION PRINCIPLE

- Electrons have spin which gives rise to a tiny magnetic field and to a spin quantum number (m^s)

- Pauli Exclusion Principle: No two electrons in an atom can have the same four quantum numbers

- Effective Nuclear Charge (Z_{eff}): The nuclear charge actually felt by an electron

- Electron shielding leads to energy difference between ns, np, and nf orbitals

video about effective nuclear charge

$$Z_{eff} = Z - S$$

Bottom line: electrons are farther from the nucleus

IMPORTANT PRINCIPLES

- Electron Configuration: A description of which orbitals are occupied by electrons

- Degenerate Orbitals: Orbitals that have the same energy level. For example, the three p orbitals in a given shell

- Ground-State Electron Configuration: The lowest-energy configuration

- Aufbau Principle ("building up"): A guide for determining the filling order of orbitals

- Lower-energy orbitals fill before higher-energy orbitals

- An orbital can only hold two electrons, which must have opposite spins (Pauli

Exc. Principle)

- If two or more degenerate orbitals are available, follow Hund's rule
- Hund's Rule: If two or more orbitals with the same energy are available, one electron goes into each until all are half-full. The electrons in the half-filled orbitals all have the same value of their spin quantum number.

ELECTRON CONFIGURATION

- The S block has a maximum of 2 electrons
- The D block has a maximum of 10 electrons
- The P block has a maximum of 6 electrons
- Exceptions in "Expected" vs. "Actual" configuration

Cr:	Expected:	(Ar) 4s ² 3d ⁴
	Actual:	(Ar) 4s ¹ 3d ⁵

LiCl makes a red flame

NaCl makes a yellow flame >>> yellow flame = sodium

KCl makes a lilac flame

Photon: beam of light that behaves as a stream of small particles

How many orbitals are in 4th shell? A: 16