Chapter 7: Ionic and Metallic Bonding

- The electrons in the OUTER energy level are responsible for the chemical and physical properties of each atom
- These are called the valence electrons

-the s and p electrons in the outer energy level for representative elements

- Inner electrons are called core electrons

Keeping Track of Electrons

Atoms in the same group (column) have...

1. the same electron configuration
2. the same number of valence electrons

group number (Ia, VIa) = # of valence electrons
example: Be, Mg, Ca have 2 valence electrons

Electron Dot Diagrams

- Also called Lewis dot diagrams
- way of showing valence electrons

How to write them:

1. Write the symbol to represent the nucleus and the core electrons
2. Start drawing electrons (remember Hund's rule-they don't pair up until they have to)
3. Max 8 electrons

Example: Nitrogen

In forming compounds, atoms tend to achieve Noble gas Configuration; 8 electrons in the outer level is stable.

Forming Cations:

- Metals lose their valence electrons to achieve Noble Gas configuration
- This makes them positive (more positive protons than negative electrons)

Example: Na: $1s^2 2s^2 2p^6 3s^1$ 1valence electron
Na^+: $1s^2 2s^2 2p^6$ resembles Neon with 8 valence electrons

Electron dot diagrams for cations:
Example: Ca

No dots, postive charge

Forming Anions:

- Non metals gain electrons to achieve Noble gas configurations
- They make negative ions (more negative electrons than positive protons)

Example: S= $1s^2 2s^2 2p^6 3s^2 3p^4$ 6 valence e.
S^{2-}= $1s^2 2s^2 2p^6 3s^2 3p^6$ 8 valence e.

Electron dot diagrams for anions:
Example: Phosphide ion

Section 7.2- Ionic Bonds and Ionic Compounds

Ionic Bonding:

- Formed when an electron or electrons are transferred from metals or NH_4^+ to non metals producing oppositely charged ions (cations and anions) that are electrostatically attracted to each other.

- The difference in electronegativity (△EN) is generally larger than 1.7
- Example: NaCl △EN --> 3.0-0.9 =2.1 The difference is greater than 1.7 so an electron is *transferred*
- Ionic compounds are also called salts
- Simplest ratio of elements in an ionic compound is called a formula unit

•Atoms are trying to achieve noble gas configuration

Example:

Na Cl

PROPERTIES OF IONIC COMPOUNDS

1. Most ionic compounds are crystalline solids at room temperature.
2. Ionic compounds generally have high melting and boiling points.
3. Under pressure ionic crystals will shatter or cleave.

4. Ionic compounds can conduct and electric current (are electrolytes) in their molten (liquid) state and also in their aqueous (when dissolved in water) state.