

# Chemical Bonds

# Bonding Atoms

- Why do atoms bond?
  - each atom wants a full outermost energy level
  - gain, lose, and share valence electrons to achieve the duet or octet rule aka: “being happy”
  - gives each atom an electron configuration similar to that of a noble gas
    - ex. Group 18: He, Ne, Ar

# Chemical Bonds

- Chemical Bonds
  - attractive force that holds atoms or ions together
  - 2 types
    - ionic & covalent
  - determines the structure of compound
  - structure affects properties
    - melting/boiling pts, conductivity etc.

# Ionic Bonds / Ionic Compounds

## ▪ Definition

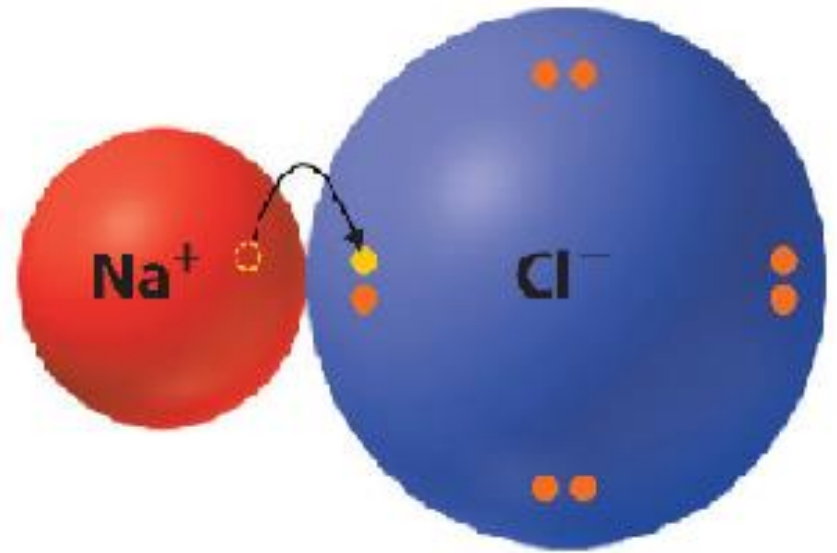
- bond formed by the attraction between cations (positive: lost electrons) and anions (negative: gained electrons). Cations are always metals and anions are always nonmetals.
- oppositely charged ions attract each other and form an ionic bond



- electrons are transferred from one atom to another
- negative ions attract more positive ions, and soon a network is formed

ex.  $\text{Na}^+ + \text{Cl}^- = \text{NaCl}$

- electrons are  
transferred from one  
atom to another



### **Ionic bond**

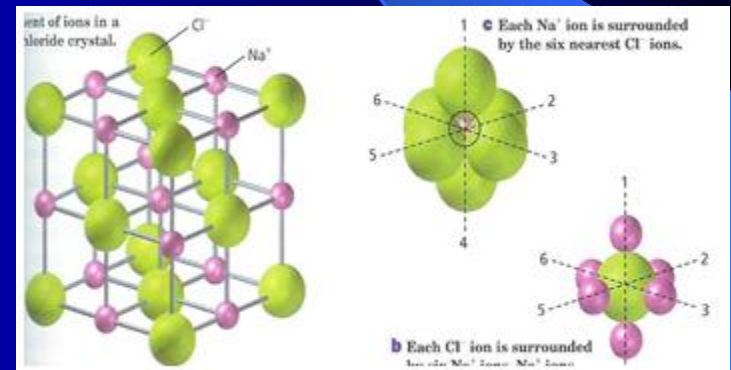
Complete transfer of one or more  
valence electrons.

Full charges on resulting ions.

# Networks / Crystal Lattices

- negative ions attract more positive ions, and soon a network of a repeating pattern of multiple ions is formed

ex. NaCl - every Na ion is next to 6 Cl ions, and every Cl ion is surrounded by 6 Na ions.



- strong attraction between ions creates a rigid framework, or lattice structure: aka: crystals
- ex: cubes, hexagons, tetragons

# Properties of Ionic Compounds

- strong attractions between ions: strong bonds
  - high melting/boiling pt
  - shatter when struck (think of it as one unit)
  - conductivity
    - solid: ions are so close together, fixed positions, (can't move)  
NO conductivity
    - liquid: ions are freely moving due to a broken lattice structure  
Good conductivity

# Naming Ions

## ■ Monoatomic Ions

- cation

- name of element with ion

ex. (Na) Sodium (Na<sup>+</sup>) Sodium ion

- anion

- name of element with the suffix -ide

ex. (Br) Bromine (Br<sup>-</sup>) Bromide

## ■ Ions with multiple cations

- transition metals

- most form 2<sup>+</sup>, 3<sup>+</sup> and 4<sup>+</sup>

ex. Cu<sup>+</sup>, Cu<sup>2+</sup>



# Naming Ionic Compounds

- Naming ionic compounds (binary)

## Formula to Name

- name of cation followed by the name of the anion

ex. NaCl: Sodium Chloride

- formulas must indicate the relative number of cations and ions if transitional

ZnO: Zinc (II) Oxide

CuCl<sub>2</sub>: Copper (II) Chloride

# Naming Ionic Compounds

- Practice Problems



# Practice Problems

- Write the formula for the following atoms
  - a. lithium oxide
  - b. beryllium chloride
  - c. titanium (III) nitride
  - d. copper (II) bromide