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

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

- electrons are <u>transferred</u> from one atom to another

- negative ions attract more positive ions, and soon a network is formed

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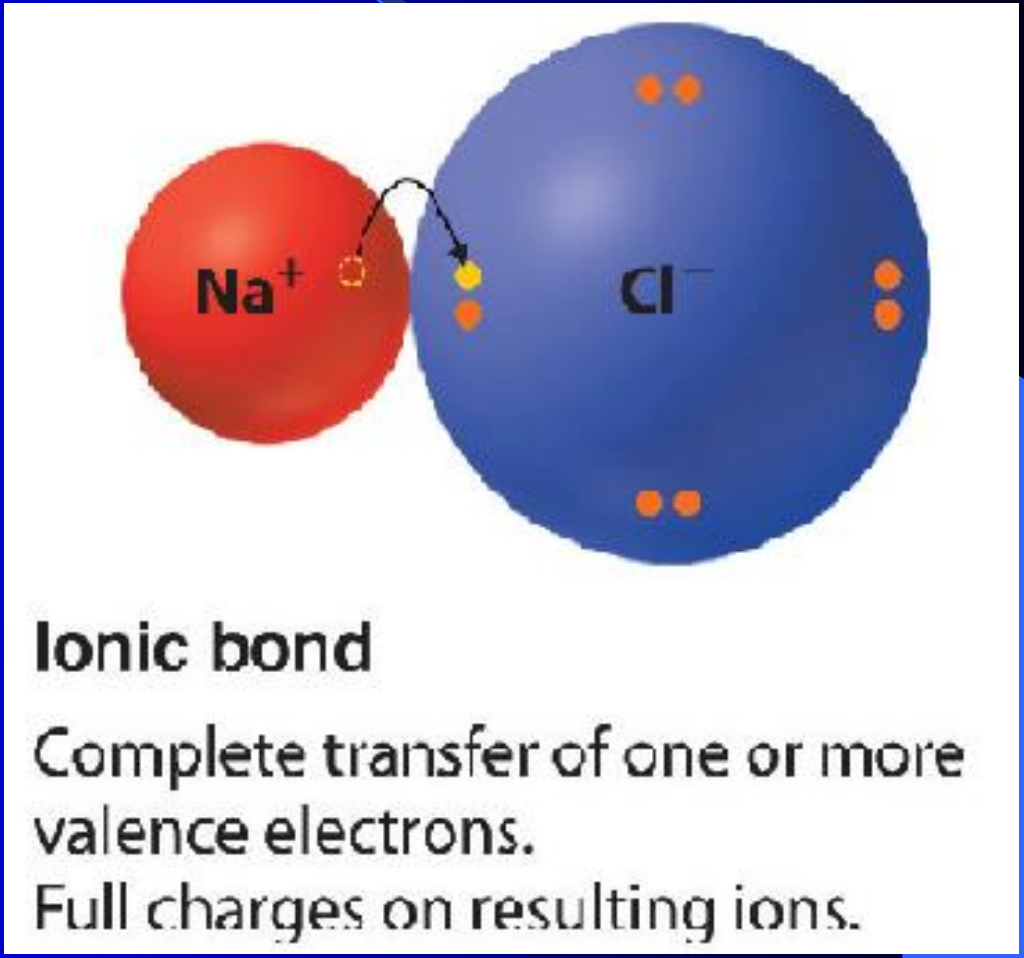
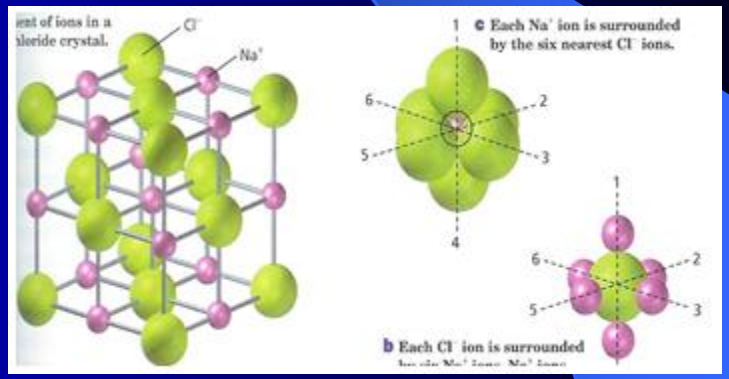


Networks / Crystal Lattices

- 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+) Sodium ion
  - anion
    - - name of element with the suffix –ide
      - ex. (Br) Bromine (Br-) Bromide
- Ions with multiple cations
  - transition metals
  - most form 2^+, 3^+ and 4^+
    - ex. Cu^+, Cu^{2+}

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

    $CuCl_2$: Copper (II) Chloride

Naming Ionic Compounds

- Practice Problems

$MgBr_2$	Magnesium Bromide
KI	Potassium Iodide
$CuCl_2$	Copper (II) Chloride
Fe_2S_3	Iron (III) Sulfide

Practice Problems

- Write the formula for the following atoms
  a. lithium oxide

     Li_2O

  b. beryllium chloride

     $BeCl_2$

  c. titanium (III) nitride

     TiN

  d. copper (II) bromide

     $CuBr_2$