Bonding

- occurs when 2 or more elements link together to create molecules.

- 2 types of bonds
  1) ionic
  2) covalent
     A) pure covalent
     B) polar covalent

- Reason atoms bond → Octet Rule

All elements "want" to have 8 valence e⁻'s (full s & p suborbital) - creates stability (exception: H and He - only need 2 valence e's)

1) Ionic Bonding

- occur between a metal and a nonmetal

metals

- have low 1ST ionization energies (easily give away their valence e⁻)

- become positively charged ions (charged atom), CATIONS

Ex)

Mg
atomic # 12
$12p^+$ & ~~12e⁻~~ 10e⁻

$1s^2 2s^2 2p^6 3s^{\cancel{2}}$
(new valence e⁻'s) (valence e⁻ given up)

becomes a cation with a charge of +2.

Mg^{+2} or Mg^{2+}

Ex)

Ge

atomic # 32

$32p^+ : 32e^-$

$-4e^-$ lost

$28e^-$

$1s^2 2s^2 2p^6 \underline{3s^2 3p^6} 4s^2 3d^{10} 4p^2$

new valence orbital w/ 8 e^-

never ← valence e^-

lose all 4 valence e^-'s

becomes the cation, Ge^{4+}

Nonmetals

- have high electronegativities (really "want" other atom's e^-'s.) - steal e^- from metals
- become negatively charge ions, ANIONS

Ex)

F

atomic # 9

$9p^+ : 9e^-$

$+1e^-$

$10e^-$

charge of -1

steal 1 e^-

$1s^2 \underline{2s^2 2p^5}^{+1}$

has 7 val. e^- originally

now has 8 val. e^-

becomes an anion

F^{1-} or F^{-1} or F^-

Ex)

P

atomic # 15

$15p^+ : 15e^-$

$+3e^-$

$18e^-$

steal 3 e^-

$1s^2 2s^2 2p^6 \underline{3s^2 3p^3}^{+3}$

originally has 5 val e^-

now has val. e^-

becomes P^{3-} or P^{-3}

Summary

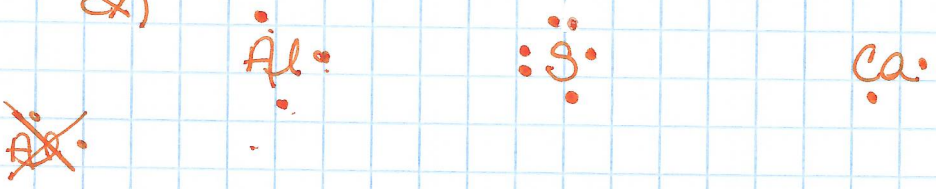
- metals lose valence e^- to become stable cations
- Nometals gain valence e^- to become stable anions
- The + cation is attracted to the − anion, forming the ionic bond

Using electron dot diagrams to show the forming of an ionic bond

e^- dot diagrams

use the symbol for the element & up to 8 dots surrounding it to represent the valence e^-'s.

Ex)

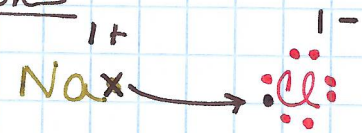


~~Al~~

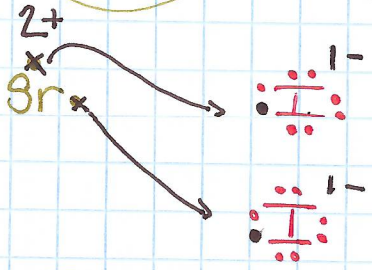
Steps

1) Draw e^- dot diagrams for the metal & nonmetal.
2) Draw arrows to show the e^-'s transferring from the metal to the nonmetal.
3) write the charges that form
4) write the formula for the new ionic molecule

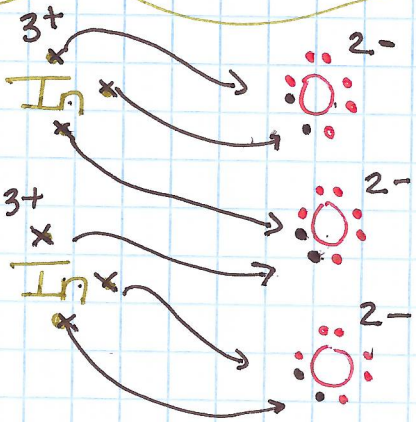
Examples



formula
NaCl

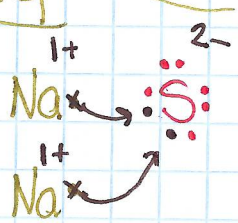


SrI_2



In_2O_3

Try



Na_2S

Properties of Ionic Compounds

1) extremely strong bonds
2) high melting & boiling points
3) hard, crystalline solids
4) conduct electricity when molten or dissolved in solution