

Chemical Bonding Study Guide

General Rule of Thumb:

metal + nonmetal =

nonmetal + nonmetal(s) =

Intro to Ionic Bonds!

Knowing electron configurations is important because the number of valence electrons determines the chemical properties of an element.

Valence Electrons:

All elements in a particular group or family have the same number of valence electrons (and this number is equal to the group number of that element)

Examples:

Electron dot structures show the valence electrons as dots around the element's symbol:

Li B Si N O F Ne

Noble gas atoms are very stable; they have stable electron configurations. In forming compounds, atoms make adjustments to achieve the lowest possible (or most stable) energy.

Octet rule:

- Atoms of **METALS** obey this rule by losing electrons.
Na:
Na⁺
- Atoms of **NONMETALS** obey this rule by gaining electrons.
Cl:
Cl⁻
- Transition metals are exceptions to this rule.

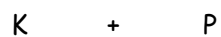
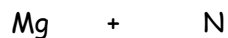
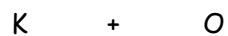
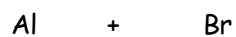
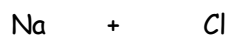
Example: silver (Ag)

By losing one electron, it acquires a relatively stable configuration with its 4d sublevel filled (pseudo noble-gas)

IONIC BONDS / COMPOUNDS

- Anions and cations have opposite charges; they attract one another by electrostatic forces (IONIC BONDS)
 - Ionic compounds are electrically neutral groups of ions joined together by electrostatic forces. (also known as salts)
- ** the positive charges of the cations must equal the negative charges of the anions.
** use electron dot structures to predict the ratios in which different cations and anions will combine.

Examples:



Notes: Covalent Bonds

- **Covalent bonds:** occur between 2 nonmetals; electrons are shared not transferred, as in ionic bonds)
- The result of sharing electrons is that atoms attain a more stable electron configuration.
- Most covalent bonds involve:
 - 2 electrons (single covalent bond)
 - 4 electrons (double covalent bond)
 - 6 electrons (triple covalent bond)

How to Draw Lewis Structures for MOLECULES

1. Add up all valence electrons for EACH atom in the molecule
(*C = ALWAYS CENTRAL, H = ALWAYS ON OUTSIDE OF STRUCTURE*)
 2. Attach atoms with a single bond (skeleton drawing)
 3. Subtract out 2 electrons for each single bond you drew (EACH BOND = 2 electrons)
 4. Distribute remaining electrons (in pairs) around atoms to obtain octet rule
(*except H, HYDROGEN ONLY WANTS 2 ELECTRONS = 1 BOND to be like Helium noble gas*)
 5. If there's not enough electrons to satisfy the octet rule, make MULTIPLE BONDS (double, triple)
- **Lewis structures** (electron dot structures) show the structure of molecules. (Bonds can be shown with dots for electrons, or with dashes: 1 dash = 2 electrons)

