CH 5 Nomenclature

5.1-5.6 Naming Compounds

Chemical Names & Formulas

- Objectives:
  - Explain the significance of a chemical formula
  - Determine the formula of an ionic compound formed between two given ions
  - Name an ionic compound given its formula
  - Using prefixes, name a binary molecular compound from its formula
  - Write the formula of a binary molecular compound given its name.

Chemical Formula

- Molecular compound C_8H_{18}
  1. Reveals types of atoms in single molecule
  2. Subscript tells the number of atoms
- Ionic Compound $Al_2(SO_4)_3$
  1. Formula unit tells the ratio of cations to anions
  2. Subscript tells the number of that atom in the unit
  3. Charges of ions represented at superscripts with the charge symbol
- Monoatomic Ions
  1. Ions formed from a single atom
     1. Groups help identify gaining or losing e-
     2. D block can form multiple cations
- Nomenclature: naming system

Naming Ionic Binary Compounds

- Ionic- metal + nonmetal
- Positive ion (cation) always comes first!
- Name the ions!
- If the metal forms only one cation…

1. Name cation (elements name)
2. Name anion
    1. Start w. beginning of element's name (root) and add –ide suffix
    2. Ex. Chlorine → chloride

Practice

- Name the following compounds:
  - CaO
  - NaI
  - $AlCl_3$

If the cation forms more than one cation …

- usually transition metal (some group 3 elements)

1. Name cation
2. Specify which ion formed w/ Roman Numeral in parentheses after name of cation

   - $FeCl_2$

   ? + 2 (1-) =0 must balance w/ 2 Cl 1- charges

   OR REVERSE CROSS OVER METHOD

3. Write name of anion w/ “ide” ending

Practice

- Write the name for the following compounds:

PbO_2 *

Fe_2O_3

MgO_2

Naming Covalent Binary Compounds

- Contains only nonmetals

1. Name first element (full name)
2. Name 2nd element
3. Add prefixes to show # of atoms present for each element

-mono- never used on first element

- CO *carbon monoxide*

Mono-1 di-2 tri-3 tetra-4 penta-5 hexa-6 hepta-7 Octa-8

Practice

- Write the name for the following compounds:

1. BF_3
2. NO (* often drop o or a on prefix if element following is oxygen)
3. N_2O_5

Water (H_2O) & Ammonia (NH_3) always referred to as common name

Fig 5.1

Naming Compounds w/ Polyatomic Ions

- Charged entities w/ several atoms bonded together assigned special names
- Some anions contain element bonded w/ differing # oxygen atoms = oxyganions
  - When 2 in a series, one w/ less oxygen atoms ends w/ -ite; w/ more oxygen ends w/ -ate
  - Ex. SO_3^{2-} sulfite SO_4^{2-} sulfate

Naming Compounds w/ Polyatomic Ions

- When more 2 oxyanions make up series:

  Hypo (less than) and per- (more than) used as prefixes to name members w/ fewest + most oxygen atoms

  ClO^- hypochlorite

  ClO_2^- chlorite

  ClO_3^- chlorate

  ClO_4^- perchlorate

  Rules for naming compounds apply the same to these

Naming Acids

- Acids: substances that when dissolved in H_2O, produce H^+ ions (protons)
  - First recognized by sour taste
  - Ex. citric acid (tartness of lemons + limes)
  - Rules depend on whether anion has oxygen involved

Naming Acids w/o Oxygen involved

- Acid named w/ prefix hydro- and suffix –ic attached to root name of element
- Ex. gaseous HCl dissolved in water forms hydrochloric acid
- Ex. H_2S dissolved in water hydrosulfuric acid

Naming Acids w/ Oxygen involved

- Root name the central atom of the anion or anions name w/ suffix –ic or –ous
  - When anion name ends in –ate → -ic is used
  - Ex. H_2SO_4 SO_4^{2-} (anion) sulfate sulfuric acid
  - When anion name ends in –ite suffix → -ous is used
  - Ex. H_2SO_3 SO_3^{2-} sulfite sulfurous acid

Fig 5.3