Tutorial 6: Writing Chemical Formulas for Molecular Compounds and Acids

Goals:

- ✓ Be able to write formulas and names for molecular compounds and acids.
- ✓ Memorize the 7 elements that exist in diatomic form.
- ✓ Memorize 10 designated prefixes for naming molecular compounds.
- ✓ Know what combination of atoms will result in formation of an ionic versus a molecular compound.

Naming Molecular Compounds

- **Molecular Compounds:** Molecular compounds form when electrons are shared between atoms in order to achieve octet. Molecular compounds are held together by covalent (aka: molecular) bonds and are typically formed between nonmetals only. There are no ions in molecular compounds.

- There are seven elements that exist in nature as diatomic molecules: H_2, F_2, Cl_2, Br_2, I_2, N_2, O_2

- When there are two or more different types of atoms in a molecular compound we must use prefixes to tell how many atoms of each element are present.

Number	Prefix
1	mono-
2	di-
3	tri-
4	tetra-
5	penta-
6	hexa-
7	hepta-
8	octa-
9	nona-
10	deca-

Naming Molecular Compounds

Formula to Name:

- Write the name of the leftmost nonmetal using the appropriate prefix. If there is only one of the first element the mono- prefix is dropped.
- Write the stem of the rightmost nonmetal with the –ide ending using the appropriate prefix. Never drop the mono- prefix from the second element!
- A few spelling rules for double vowels: ao is written as o; oo is written as o; ii is still written as ii.

Examples:

SF_6 is named as sulfur hexafluoride

N_2O_4 is named as dinitrogen tetroxide

Name to Formula:

Examples:

Carbon monoxide is written as the formula CO

Silicon tetrachloride is written as $SiCl_4$

NOTE: For some compounds, common names are used almost exclusively and should therefore be memorized. I recommend that you memorize the common name for H_2O (water) and NH_3 (ammonia). Your instructor may have further recommendations.

Ionic Versus Molecular Compounds

- Ionic compounds form when metals transfer valence electrons to nonmetals forming cations and anions, respectively. The ratio of cations to anions is always expressed in the simplest whole number ratio known as a **formula unit**.

Examples:

NaCl

$CaBr_2$

- Molecular compounds form when nonmetals share electrons to form covalent bonds. The formula for a molecular compound shows the number of atoms that are combined in one **molecule**. Molecular compounds are not necessarily in the simplest whole number ratio of atoms since different molecular compounds can form when the same elements combine (see example below).

Examples:

NO

N_2O_4

Naming Common Acids

Acid: An acid is a substance that is capable of donating a hydrogen ion (H^+). Some common acids are included below.

Binary Acids

Formula	Name
HF	Hydrofluoric acid
HI	Hydroiodic acid
HCl	Hydrochloric acid
HBr	Hydrobromic acid

Oxyacids

Formula	Name
H_2SO_4	Sulfuric acid
H_2SO_3	Sulfurous acid
HNO_3	Nitric acid
HNO_2	Nitrous acid
H_2CO_3	Carbonic acid
H_3PO_4	Phosphoric acid
$HC_2H_3O_2$	Acetic acid