



Naming and Writing Formulas for Molecular Compounds

MOLECULAR COMPOUND NAMES

NAMING MOLECULAR COMPOUNDS

- There are two methods used for naming molecular compounds:
- Traditional
- IUPAC



MOLECULAR COMPOUNDS

- Molecular compounds are formed between two **nonmetals**.
- Electrons are **shared** between the atoms.

NAMING MOLECULAR COMPOUNDS

- Traditional uses Greek prefixes to indicate the number of atoms in the compound.
- Stock uses the **Roman numeral** to indicate the *apparent* charge on the first element.

NAMING MOLECULAR COMPOUNDS WITH IUPAC METHOD

- The shared electrons in a molecular compound may not be shared **equally**.
- Electrons may spend more time in the space closer to one with **the higher electronegativity**.
- A bookkeeping method of “assigned” charges are used. These are called “*Apparent*” charges because they are not real.

NAMING MOLECULAR COMPOUNDS

- The atom having the greater electronegativity is assigned a negative *apparent* charge and the other element is assigned a positive *apparent* charge.
- The negative *apparent* charge is usually the same charge as in the ionic state.

NAMING MOLECULAR FORMULAS

- To determine the positive *apparent* charge, multiply the negative charge number by the number of negative atoms and divide by the number of positive atoms.
- N_2O_3 O is -2 , so multiply 2×3 atoms = 6, then divide by 2 = 3;
- so the *apparent* charge on N is +3

IUPAC METHOD OF NAMING MOLECULAR COMPOUNDS

- IUPAC method involves identifying the charge on the “positive” atom as a Roman Numeral.
- Write the names for the following:
- CCl_4
- N_2O_3
- SO_3

WRITING FORMULAS FOR MOLECULAR COMPOUNDS

- The IUPAC names give the *apparent* charge on the first element, so that number becomes the *subscript* of the second element.
- The *apparent* charge on the second element becomes the *subscript* on the first element.

TRADITIONAL METHOD OF NAMING MOLECULAR COMPOUNDS

- This method uses the Greek prefixes to identify how many *atoms* are in the compound. (mono not used on the first element)
- Carbon disulfide
- Dinitrogen pentoxide
- Sulfur trioxide

NAMING MOLECULAR FORMULAS

- Name the following compounds with both methods:
- N_2O_3
- SO_3
- N_2O_5
- CH_4
- H_2S

NAMING ACIDS

- Acids are water solutions of certain molecular compounds.
- Acids can be classified into two groups based on the number of elements in the compound:
 - Binary acid
 - Ternary acid

NAMING BINARY ACIDS

- Binary acids consist of two elements:
- Hydrogen and a nonmetal.
- They are named by using a prefix of *hydro-* and the suffix of *-ic*.
- Hydrochloric acid, HCl
- Hydrosulfuric acid H₂S
- Hydroiodic acid HI

NAMING TERNARY ACIDS

- Ternary acids consist of three elements:
 - Hydrogen, a nonmetal and oxygen.
 - The nonmetal and oxygen are a polyatomic ion.
- They are named using the polyatomic ion and the correct prefix and/or suffix that is determined by the number of oxygens.

NAMING TERNARY ACIDS

- For the “normal” number of oxygen (found in the polyatomic ion with a suffix of *-ate*) use the suffix *-ic*.
- H_2SO_4 sulfuric acid
- HNO_3 nitric acid
- H_3PO_4 phosphoric acid

NAMING TERNARY ACIDS

- For one less oxygen, use suffix *-ous*.
- Polyatomic ion name will have a suffix of *-ite*.
- H_2SO_3 sulfurous acid
- HNO_2 nitrous acid

NAMING TERNARY ACIDS

- For two less oxygens, use prefix *hypo*-with the suffix *-ous*.
- Polyatomic ion will have a suffix of *-ite*.
- H_2SO_2 Hyposulfurous acid
- HNO hyponitrous acid

NAMING TERNARY ACIDS

- If one more oxygen than “normal” is present, use prefix *per-* and suffix *-ic*.
- HClO_4 perchloric acid
- HIO_4 periodic acid

NAMING AND WRITING FORMULAS FOR HYDRATES

- These are compounds that will crystallize from water and have water molecules adhering to them, becoming part of the crystal.
- They contain a specific ratio of water to each crystal.

FORMULAS FOR HYDRATES

- Formulas for hydrated compounds place the water of hydration following a **dot** after the regular formula.
- Ex. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$

NAMING HYDRATES

- The amount of water of hydration is named with a Greek prefix.
- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ cupric sulfate pentahydrate
- $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ sodium sulfate decahydrate