Molecular Compounds and Acids

Molecular Compounds: Formulas and Names (1 of 2)

- Unlike ionic compounds, the formula for a molecular compound **cannot** readily be determined from its constituent elements because the same combination of elements may form many different molecular compounds, each with a different formula.
  - Nitrogen and oxygen form all of the following unique molecular compounds: NO, NO_2, N_2O, N_2O_3, N_2O_4, and N_2O_5.

Molecular Compounds: Formulas and Names
(2 of 2)

- Molecular compounds are composed of two or more nonmetals.
- Generally, write the name of the element with the smallest group number first.
- If the two elements lie in the same group, then write the element with the greatest row number first.
- Prefixes are given to each element indicate the number of atoms present.

Binary Molecular Compounds

- These prefixes are the same as those used in naming hydrates:

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

- If there is only one atom of the **first element** in the formula, the prefix **mono**- is normally omitted.

Conceptual Connection 3.8 (1 of 2)

The compound NCl_3 is nitrogen trichloride, but $AlCl_3$ is simply aluminum chloride. Why?

a. The name forms differ because NCl_3 is an ionic compound and $AlCl_3$ is a molecular compound. Prefixes such as mono-, di-, and tri- are used for ionic compounds but not for molecular compounds.

b. The name forms differ because NCl_3 is a molecular compound and $AlCl_3$ is an ionic compound. Prefixes such as mono-, di-, and tri- are used for molecular compounds but not for ionic compounds.

Conceptual Connection 3.8 (2 of 2)

The compound NCl_3 is nitrogen trichloride, but $AlCl_3$ is simply aluminum chloride. Why?

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b. The name forms differ because NCl_3 is a molecular compound and $AlCl_3$ is an ionic compound. Prefixes such as mono-, di-, and tri- are used for molecular compounds but not for ionic compounds.

Acids (1 of 3)

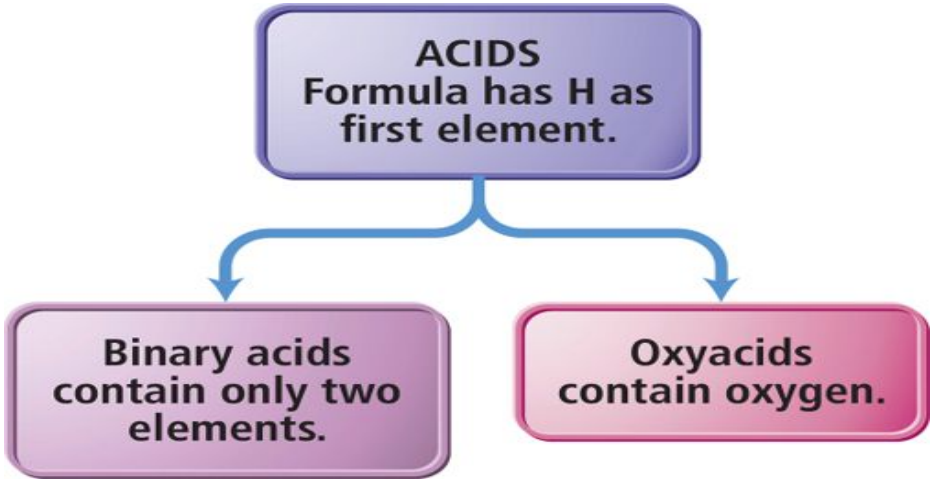
- Acids are molecular compounds that release hydrogen ions (H^+) when dissolved in water.
- Acids are composed of hydrogen, usually written first in their formulas, and one or more nonmetals, written second.

Acids (2 of 3)

- Sour taste
- Dissolve many metals
  - such as Zn, Fe, and Mg; but not Au, Ag, or Pt
- Formulas generally start with H,
  - e.g., HCl, H_2SO_4

- HCl is a molecular compound that, when dissolved in water, forms $H^+_{(aq)}$ and $Cl^-_{(aq)}$ ions, where **aqueous** (*aq*) means **dissolved in water**.

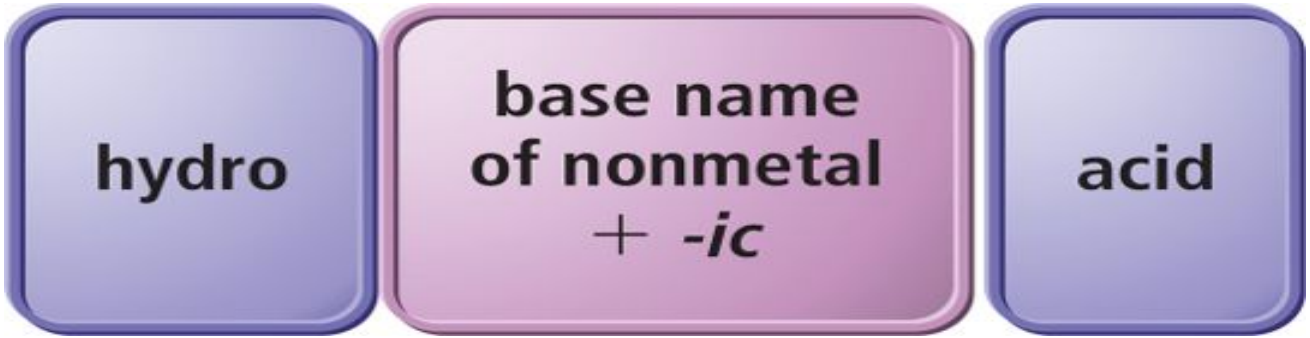
Acids (3 of 3)



- Binary acids are composed of hydrogen and a nonmetal.
- Oxyacids are composed hydrogen and an oxyanion.

Naming Binary Acids

- Write a **hydro-** prefix.
- Follow with the nonmetal base name.
- Add **-ic**.
- Write the word **acid** at the end of the name.



Naming Oxyacids

- If the polyatomic ion name ends in **-ate**, change ending to **-ic**.
- If the polyatomic ion name ends in **-ite**, change ending to **-ous**.
- Write word **acid** at the end of all names.

oxyanions ending with **-ate**

oxyanions ending with **-ite**

Practice: Name the Acid (1 of 2)

1. H_2S
2. $HClO_3$
3. $HC_2H_3O_2$

Practice: Name the Acid (2 of 2)

1. H_2S **hydrosulfuric acid**
2. $HClO_3$ **chloric acid**
3. $HC_2H_3O_2$ **acetic acid**

Writing Formulas for Acids

- When the name ends in **acid**, the formula starts with **H** followed by an anion.
- Write the formula as if it is ionic, even though it is molecular.
- **Hydro-** prefix means it is binary acid; other prefix or no prefix means the anion with H is an oxyacid.
- For an oxyacid,
  - if the ending is **-ic**, the polyatomic ion ends in **-ate**.
  - if the ending is **-ous**, the polyatomic ion ends in **-ous**.

Acid Rain

- Certain pollutants, such as NO, NO_2, SO_2, and SO_3, form acids when mixed with water, resulting in acidic rainwater.
- Acid rain can fall or flow into lakes and streams, making these bodies of water more acidic.

Inorganic Nomenclature Flowchart