

# MOLECULAR COMPOUNDS

- There are several kinds of molecular compound. We will learn to name two simple but important classes

## ① BINARY MOLECULAR COMPOUNDS

- molecular compounds containing only two elements

## ② ACIDS

- molecular compounds that dissolve in water to release  $H^+$  ions
- corrosive to metals (react with many to produce hydrogen gas)
- contact hazard: can cause chemical burns to eyes and skin
- sour taste
- turn litmus indicator RED
- two kinds of acids:

### ① BINARY ACIDS

- contain hydrogen and one other element

usually  
Group VIIA

### ② OXYACIDS

- contain hydrogen, OXYGEN, and another element

## BINARY MOLECULAR COMPOUNDS

- Named based on the elements they contain, plus prefixes to indicate the number of atoms of each element in each molecule

### ① FIRST ELEMENT

- Add a GREEK PREFIX to the name of the element.
- Omit the "MONO-" (1) prefix if there is only one atom of the first element

### ② SECOND ELEMENT

- Add a GREEK PREFIX to the STEM NAME of the element
- Add the suffix "-ide" (as if you were naming an anion)
- DO NOT omit the "mono-" prefix if there is only one atom of the second element

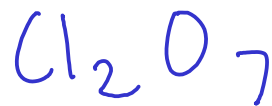
MEMORIZE THE GREEK PREFIXES. SEE COURSE WEB SITE FOR A LIST!

# BINARY MOLECULAR COMPOUNDS

Examples:



boron trifluoride



dichlorine hept(a)oxide



carbon  
monoxide



carbon  
dioxide

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carbon tetrachloride



dihydrogen monoxide



dinitrogen tetrafluoride



$\text{MgCl}_2$  : magnesium chloride, NOT "magnesium dichloride" Why not? Because this compound is not binary molecular, but IONIC. Use the ionic naming system.

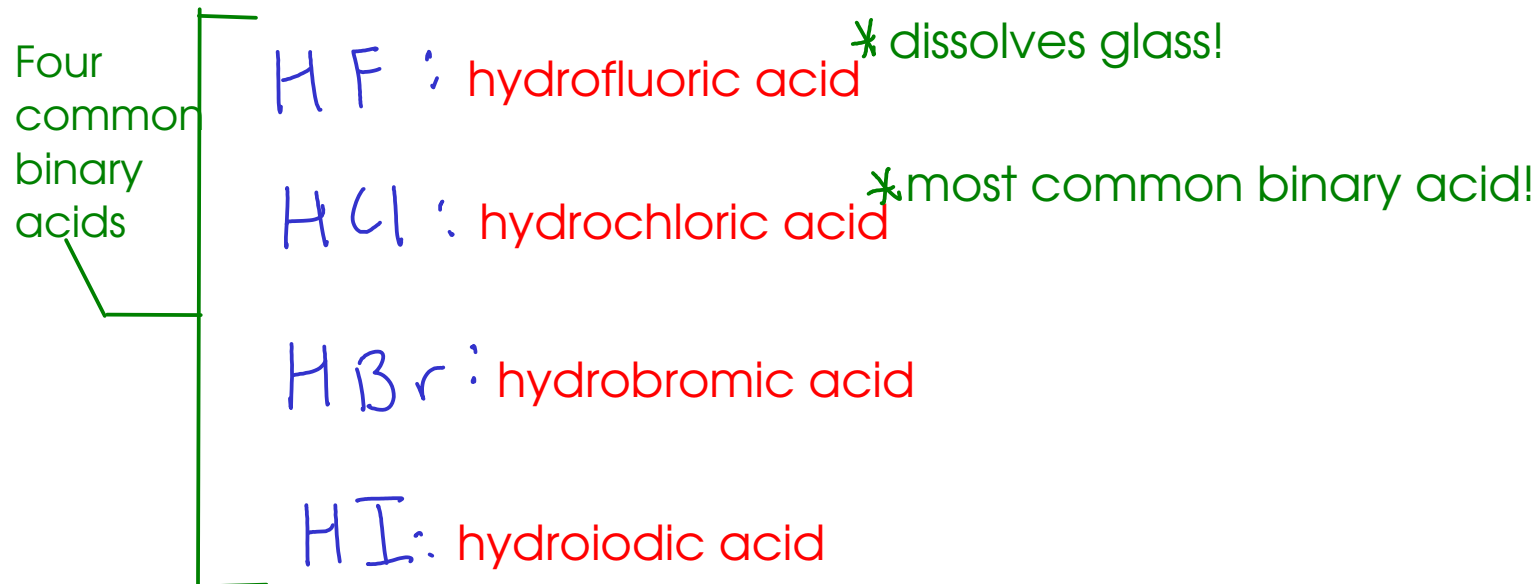


Mg is a metal! Metal/nonmetal compounds are usually ionic!

# ACIDS

## ① BINARY ACIDS

- named after the element (other than hydrogen) they contain
- common binary acids include a Group VIIA element
- named: "Hydro-" + STEM NAME OF ELEMENT+ "-ic acid"



## ② OXYACIDS

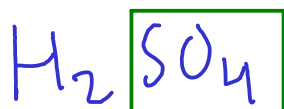
- Easy to think about as HYDROGEN IONS combined with POLYATOMIC IONS

- These acids are not true ionic compounds, but they interact with water to PRODUCE ions!

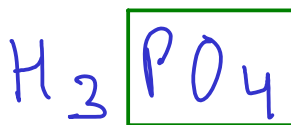
- named based on the polyatomic ion they contain, with an ending change:

① - ions ending in -ATE form acids ending in -IC

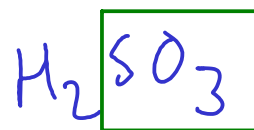
② - ions ending in -ITE form acids ending in -OUS



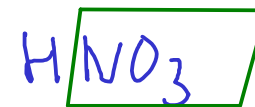
sulfuric acid



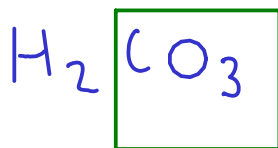
phosphoric acid



sulfurous acid



nitric acid

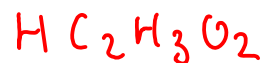
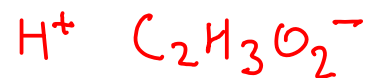


carbonic acid

# OXYACID EXAMPLES

acetic acid

└ "ate" ion



nitrous acid

└ "ite" ions



carbonic acid

└ from carbonate ion



\* The number of hydrogen ions to add to the polyatomic to make the acid equals the charge of the polyatomic.

## SUMMING UP CHEMICAL NOMENCLATURE

- You need to be able to tell, by looking at a name OR a formula, what kind of compound you are working with!

**DON'T GET THE NAMING SYSTEMS MIXED UP! EACH KIND OF COMPOUND IS NAMED WITH ITS OWN SYSTEM!**

### FROM A CHEMICAL NAME

- If the name has a Roman numeral, the name of a metal, or "ammonium", the compound is likely IONIC

- If the name has a Greek prefix, the compound is BINARY MOLECULAR

- If the name contains the word "acid":

... and starts with "hydro-", then the compound is a BINARY ACID

... and does not start with "hydro-", the compound is an OXYACID

## FROM A CHEMICAL FORMULA

- if the formula contains a metal or the  $\text{NH}_4^+$  ion, it is likely IONIC

- If the formula starts with H and is not either water or hydrogen peroxide, the compound is likely an ACID. Which kind?

- BINARY ACIDS contain only two elements

- OXYACIDS contains oxygen

- If the formula contains only nonmetals (and is not an ammonium compound or an acid), the compound is likely MOLECULAR

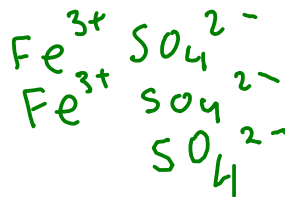
Examples:

$\text{PCl}_3$  : BINARY MOLECULAR  
Name: phosphorus trichloride

$\text{NH}_4\text{Cl}$  : IONIC (ammonium ion)  
Name: ammonium chloride

$\text{H}_3\text{PO}_4$  : OXYACID (hydrogen, phosphate)  
Name: phosphoric acid

$\text{Fe}_2(\text{SO}_4)_3$  : IONIC (iron - metal!)  
Name: iron(III) sulfate





END OF MATERIAL FOR TEST #2