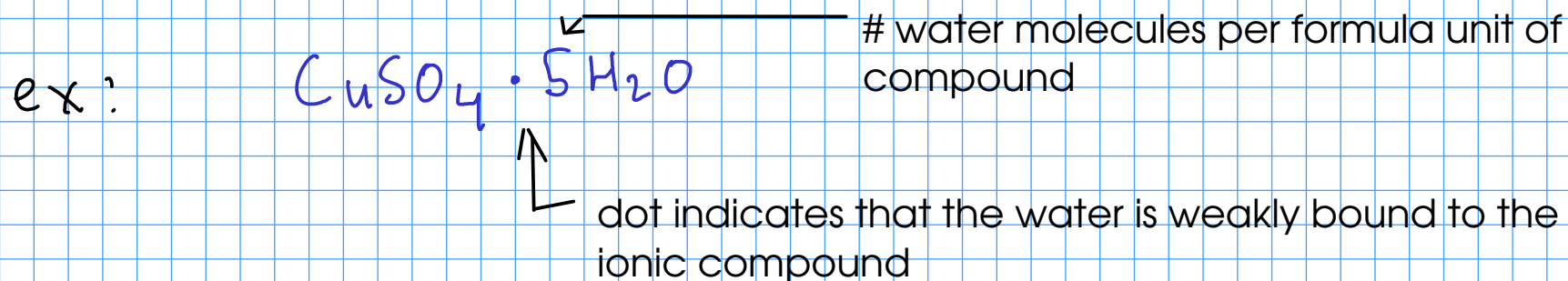


## HYDRATES

- many ionic compounds are formed by crystallizing the compound from water. Sometimes, this causes water molecules to become part of the crystal structure.
- This water is present in a definite ratio to the ions in the compound. Can be removed by heating, but will NOT evaporate if the compound is left standing.



- many DESSICANTS are hydrates that have had their water molecules driven off. They will slowly reabsorb water from the air (and keep the environment in a dessicator at a low humidity)

- Hydrates are named using the name of the ionic compound, and a Greek prefix in front of the word "hydrate" to indicate how many water molecules are associated

Copper (II) sulfate pentahydrate

# 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 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

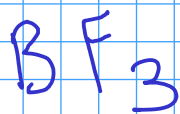
### ② SECOND ELEMENT

- 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

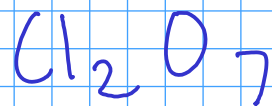
**MEMORIZE THE GREEK PREFIXES. SEE COURSE WEB SITE FOR A LIST!  
THESE ARE THE SAME PREFIXES USED FOR THE HYDRATES!**

# BINARY MOLECULAR COMPOUNDS

Examples:



boron trifluoride



dichlorine heptaoxide  
(or dichlorine heptoxide)



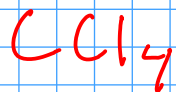
carbon monoxide



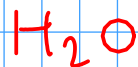
carbon dioxide

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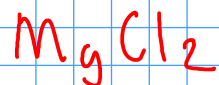
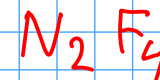
carbon tetrachloride



dihydrogen monoxide



dinitrogen tetrafluoride



"magnesium chloride", NOT "magnesium dichloride". This is an IONIC compound and is named with the system we discussed earlier.

magnesium is a Group IA METAL!

# 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"

Four  
common  
binary  
acids

$\text{HF}$ : hydrofluoric acid ✖ dissolves glass!

$\text{HCl}$ : hydrochloric acid ✖ most common binary acid!

$\text{HBr}$ : hydrobromic acid

$\text{HI}$ : hydroiodic acid

# ACIDS

## ② OXYACIDS

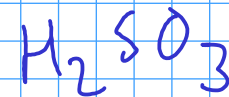
- Easy to think about as HYDROGEN IONS combined with POLYATOMIC IONS
- These acids are not true ionic compounds, but they interact with water to PRODUCE ions!
- named based on the polyatomic ion they contain, with an ending change:
  - ① - ions ending in -ATE form acids ending in -IC
  - ② - ions ending in -ITE form acids ending in -OUS



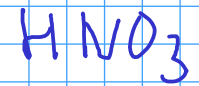
sulfuric acid



phosphoric acid



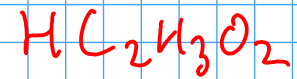
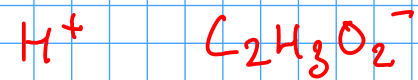
sulfurous acid



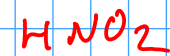
nitric acid

# OXYACID EXAMPLES

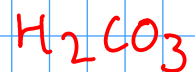
acetic acid



nitrous acid



carbonic acid



## 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 AND the prefix is NOT in front of the word "hydrate", 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  $\text{H}_2\text{O}$  or  $\text{H}_2\text{O}_2$  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