

## NAMES OF IONS

- To properly discuss ions and ionic compounds, we have to know how to name them!

### CATIONS

3 kinds:

① Main group cations (metals that take only one charge when forming ions)

- The element's name is the same as the ion's name!



② Transition metal cations (from metals that can form several cations)

- The CHARGE of the cation must be given. Use a ROMAN NUMERAL after the element name to indicate charge!



③ Polyatomic cations

- Memorize list.



## ANIONS

2 kinds

①

Main-group nonmetals

- Use the STEM NAME of the element, then add "-ide" suffix

 $\text{N}^{3-}$  : "nitride" ion $\text{P}^{3-}$  : "phosphide ion" $\text{S}^{2-}$  : sulfide ion $\text{O}^{2-}$  : "oxide ion" $\text{F}^{-}$  : "fluoride ion"

②

Polyatomic ions

- Memorize list.(see web site)

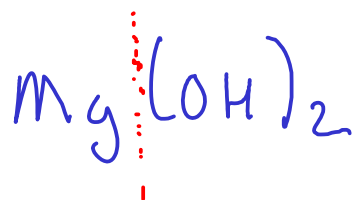
 $\text{C}_2\text{H}_3\text{O}_2^-$  : "acetate ion" $\text{SO}_4^{2-}$  : "sulfate ion" $\text{NO}_3^-$  : "nitrate ion" $\text{SO}_3^{2-}$  "sulfite ion" $\text{NO}_2^-$  : "nitrite ion"

\* Polyatomic ions ending in "-ate" and "-ite" suffixes always contain oxygen! "-ate" ions have more oxygen atoms than their "-ite" counterparts.

## NAMING IONIC COMPOUNDS

- The name of the compound is based on the name of the ions in the compound
- Cation first, anion second

Examples:



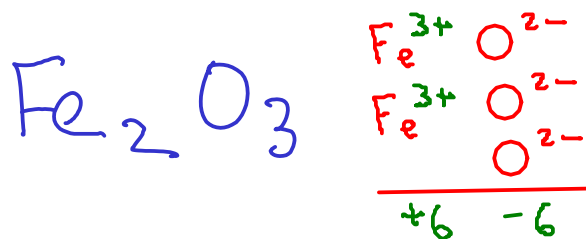
magnesium hydroxide



sodium sulfide



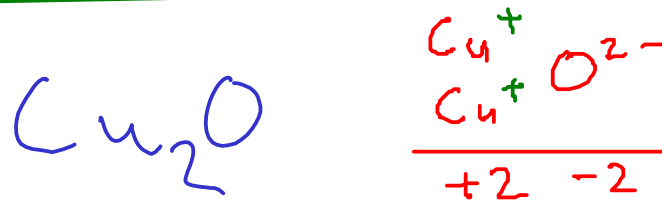
beryllium bromide



iron(III) oxide



copper(II) oxide

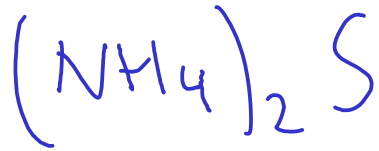


copper(I) oxide

Remember to include the Roman numeral for CHARGE in the name of transition metal compounds!

Page 63 (9th edition): Chart of polyatomic ions

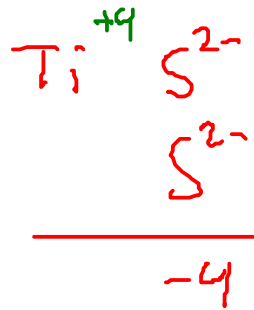
## NAMING IONIC COMPOUNDS



ammonium sulfide



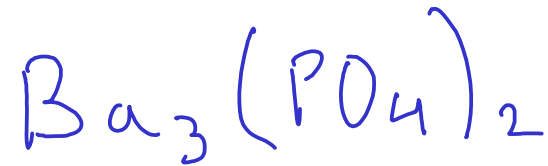
titanium(IV) sulfide



(TiS = titanium(II) sulfide!)



calcium nitrate



barium phosphate



barium phosphide

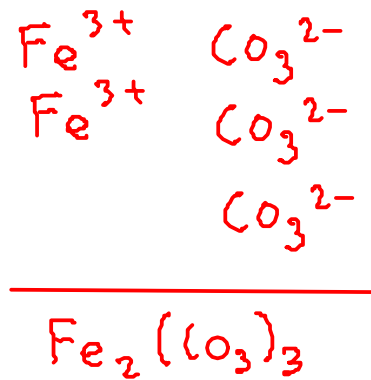
Spelling matters!

## DETERMINING THE FORMULA OF AN IONIC COMPOUND FROM THE NAME

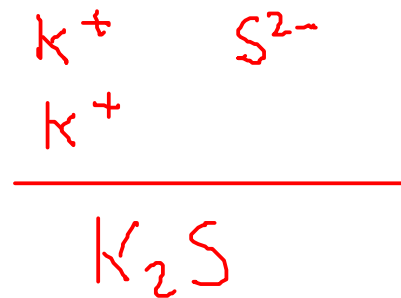
- The name of an ionic compound is made of the names of the CATION and ANION in the compound.
  - To get the FORMULA, you must figure out the SMALLEST RATIO of cation to anion that makes the charges balance out
- 

Examples:

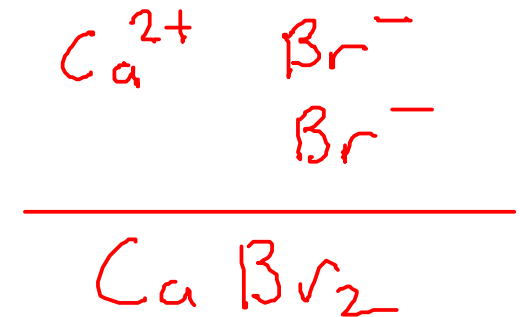
iron(III) carbonate



potassium sulfide

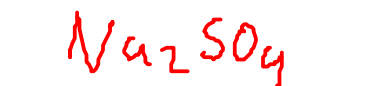


calcium bromide



## DETERMINING IONIC FORMULAS

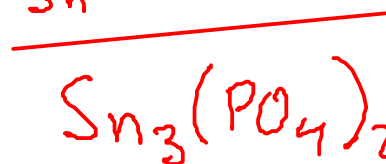
sodium sulfate



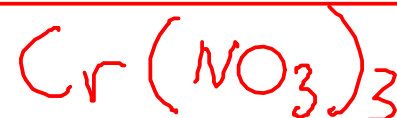
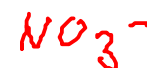
strontium oxide



tin(II) phosphate



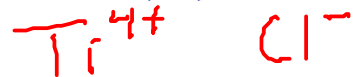
chromium(III) nitrate



barium hydroxide



titanium(IV) chloride

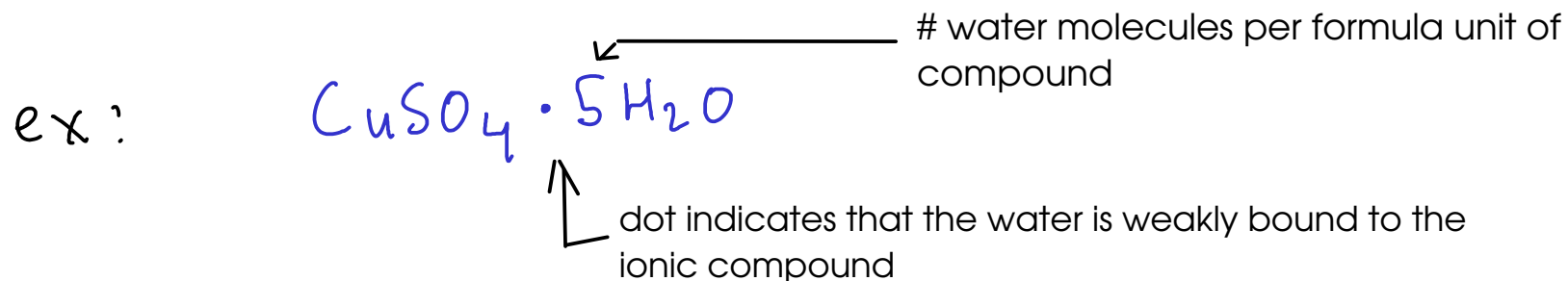


Don't forget the parenthesis when you have more than one hydroxide ion!

## HYDRATES

- many ionic compounds are formed by crystallizing the compound from water. Sometimes, this causes water molecules to become part of the crystal structure.

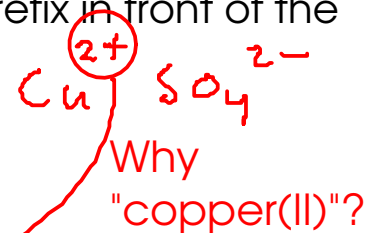
- This water is present in a definite ratio to the ions in the compound. Can be removed by heating, but will NOT evaporate if the compound is left standing.



- 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

#### ② OXYACIDS

- contain hydrogen, OXYGEN, and another element

Usually from  
Group VIIA



## 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

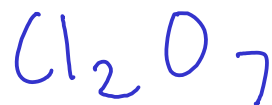
**MEMORIZE THE GREEK PREFIXES. SEE COURSE WEB SITE FOR A LIST!  
THESE ARE THE SAME PREFIXES USED FOR THE HYDRATES!**

## BINARY MOLECULAR COMPOUNDS

Examples:



boron trifluoride

dichlorine heptaoxide  
(OR dichlorine heptoxide)

carbon monoxide



carbon dioxide

\*Note: metalloids like boron behave chemically like nonmetals do.

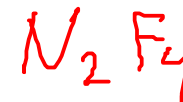
carbon tetrachloride



dihydrogen monoxide



dinitrogen tetrafluoride



$\text{MgCl}_2$  : magnesium CHLORIDE (not "dichloride"). We must use the naming system for IONIC compounds for this one.

We can tell that this compound is ionic because it contains a metal joined to a nonmetal. Metal/nonmetal compounds are usually ionic.