

Ms. B's Handy-Dandy Naming Guide

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Going from a Chemical Formula to a Name (HCl to hydrochloric acid, for example)

IS THIS COMPOUND AN IONIC COMPOUND, A  
COVALENT COMPOUND OR AN ACID?

Ionic compounds are made with either metals to non-metals or contain polyatomic ions

Covalent compounds contain only nonmetals and DON'T contain any polyatomic ions

Acids all start with a hydrogen in their formula and then have some negative ion following

**1. Take the formula** and break it back up into the ions it came from.

Ex NaCl goes to  $\text{Na}^+$  and  $\text{Cl}^-$

**2. Write the name** of the first ion (the cation)

Ex  $\text{Na}^+$  is named "sodium"

**3. Write the name** of the second ion (the anion)

Ex  $\text{Cl}^-$  is named "chloride"

**4. Say them both together.**

Ex NaCl is "sodium chloride"

**BE CAREFULS:**

1. **Never** use any of the Greek prefixes (only used for MOLECULES). If there is more than one of a cation or anion, you still just say that name once.

Ex  $\text{CaCl}_2$  is calcium chloride, NOT calcium dichloride

2. Remember to write the roman numeral for the transition metals that indicates their charge.

Ex  $\text{Fe}(\text{OH})_3$  is iron (III) hydroxide, not just iron hydroxide.

**1. Take the formula** and identify the nonmetals.

Ex  $\text{PCl}_3$  contains phosphorus and chlorine (two nonmetals)

Ex  $\text{N}_2\text{O}_4$  contains nitrogen and oxygen

**2. Write the name** of the first nonmetal and save a little room in the front for a Greek prefix later.

Ex  $\text{PCl}_3$  you should write " phosphorus"

Ex  $\text{N}_2\text{O}_4$  you should write " nitrogen"

**3. Write the name** of the second nonmetal, but change the ending to "-ide". Leave a space in front.

Ex  $\text{PCl}_3$  you should write " chloride"

Ex  $\text{N}_2\text{O}_4$  you should write " oxide"

**4. Put the Greek prefixes** in the spaces front of each nonmetal to indicate how many, except you don't use "mono" on the first nonmetal.

Ex  $\text{PCl}_3$  you should write "phosphorus trichloride" (no "mono in front of the phosphorus)

Ex  $\text{N}_2\text{O}_4$  you should write "dinitrogen tetraoxide"

**Greek Prefixes** [1-mono] [2-di] [3-tri] [4-tetra] [5-penta] [6-hexa] [7-hepta] [8-octa] [9-nona] [10-deca] (memorize these)

**BE CAREFULS:**

1. If you see three or more nonmetals, you probably have an ionic compound with a polyatomic ion you don't recognize.

Ex  $(\text{NH}_4)_2\text{CO}_3$  is the IONIC COMPOUND ammonium carbonate.

2. Don't let the Greek prefix in the ION "dichromate" fool you. It's still done as an ionic compound.

**1. Take the formula** and break it up into the  $\text{H}^+$  ion and the negative anion it came from.

Ex  $\text{H}_2\text{SO}_4$  goes to  $\text{H}^+$  and  $\text{SO}_4^{-2}$

Ex  $\text{H}_2\text{SO}_3$  goes to  $\text{H}^+$  and  $\text{SO}_3^{-2}$

Ex  $\text{H}_2\text{S}$  goes to  $\text{H}^+$  and  $\text{S}^{-2}$

**2. Identify the name** of the anion because that decides what the acid's name will be.

Ex  $\text{SO}_4^{-2}$  is called sulfate

Ex  $\text{SO}_3^{-2}$  is called sulfite

Ex  $\text{S}^{-2}$  is called sulfide

**3. Identify the ending of the anion**, which will tell you how to name the acid. There are 3 separate rules, because there are 3 separate endings for anions.

**3a. If the anion's name ends in "ate"** you take the root of that name and add "-ic acid" for the name.

Ex  $\text{H}_2\text{SO}_4$  is sulfuric acid, because  $\text{SO}_4^{-2}$  is **sulfate**

**3b. If the anion's name ends in "ite"** you take the root of that name and add "-ous acid" for the name.

Ex  $\text{H}_2\text{SO}_3$  is sulfurous acid because  $\text{SO}_3^{-2}$  is **sulfite**

**3c. If the anion's name ends in "ide"** you take the root of that name, start with "hydro-," put in the root, and end with "-ic acid" for the name.

Ex  $\text{H}_2\text{S}$  is hydrosulfuric acid because  $\text{S}^{-2}$  is **sulfide**.

**BE CAREFULS:**

1. Don't let any prefixes you see in the anions confuse you; they have NOTHING to do with naming

Ex  $\text{HClO}$  is hypochlorous acid because  $\text{ClO}^-$  is **hypochlorite**

2. Remember the tricks to naming acids

A. I **ATE** at the cafeteria and said **IC**

B. The physician said I had appendicitis (appendic **ITE** – **OUS**)

C. I'd hide Rick (**IDE HYDR O IC**)

Going from a Name to a Chemical Formula (silver nitrate to  $\text{AgNO}_3$ , for example)IS THIS COMPOUND AN IONIC COMPOUND,  
A COVALENT COMPOUND, OR AN ACID?

**Ionic compounds** are made with either metals to non-metals or contain polyatomic ions

**Covalent compounds** contain only nonmetals and DON'T contain any polyatomic ions

**Acids** all start with a hydrogen in their formula and then have some negative ion following

**1. Take the name** and write down each of the ions with their charges  
Ex calcium bromide goes to  $\text{Ca}^{+2}$  and  $\text{Br}^-$

**2. Use enough of each ion** so that the total charge will add up to zero by inspection or the "puzzle piece" method.  
Ex You need TWO  $\text{Br}^-$  ions to cancel out the one  $\text{Ca}^{+2}$ , because each bromide has only a negative one charge.

**3. Write the cation first** in the formula and use subscripts to show how many of each ion you used in order to make charges add to zero.  
Ex calcium bromide has the formula  $\text{CaBr}_2$

**BE CAREFULS:**

- If you have more than one of any polyatomic ions, you must put them in parentheses.  
Ex calcium nitrate is  $\text{Ca}(\text{NO}_3)_2$  but calcium bromide is  $\text{CaBr}_2$ , even though  $\text{Br}^-$  and  $\text{NO}_3^-$  have the same charge. The nitrate is POLYATOMIC (more than one atom)
- Be sure you don't use the roman numerals for the cations with multiple possibilities.  
Ex. iron (II) hydroxide is  $\text{Fe}(\text{OH})_2$  not  $\text{Fe}(\text{II})(\text{OH})_2$
- Don't write the charges in the final formula.  
Ex sodium iodide is  $\text{NaI}$ , not  $\text{Na}^+\text{I}^-$  when you're done.

**1. Take the name** and identify the two nonmetals.  
Ex dinitrogen trioxide has nitrogen and oxygen within it.

**2. Write the symbol** of each nonmetal and use the Greek prefix to give you the subscript for each  
Ex dinitrogen trioxide has "N" and "O" for the symbols, but you need two nitrogens and three oxygens according to the Greek prefixes.

**3. Write the entire formula** out using the symbols and subscripts.  
Ex dinitrogen trioxide is  $\text{N}_2\text{O}_3$

**Greek Prefixes** [1-mono] [2-di] [3-tri] [4-tetra] [5-penta] [6-hexa] [7-hepta] [8-octa] [9-nona] [10-deca] (memorize these)

**BE CAREFULS:**

- Writing the formula for molecules has NOTHING to do with charges. Don't let the ionic compound system fool you.  
Ex You wouldn't try to break carbon dioxide up into carbon and oxide ions, but instead would use the MOLECULE system.

**1. Take the name** and write down an  $\text{H}^+$  and the name of the anion the acid came from. You need three different rules for the three different acid names.

**1a. acids ending in "-ic acid"** came from "-ate" anions  
Ex nitric acid yields  $\text{H}^+$  and  $\text{NO}_3^-$ , hydrogen and nitrate ions

**1b. acids ending in "-ous acid"** came from "-ite" anions  
Ex nitrous acid yields  $\text{H}^+$  and  $\text{NO}_2^-$ , hydrogen and nitrite ions

**1c. acids starting with "hydro-" and ending in "-ic acid"** came from "-ide" anions  
Ex hydronitric acid yields  $\text{H}^+$  and  $\text{N}^{3-}$ , hydrogen and nitride ions.

**2. Put acids together** using their charges just like you do ionic compounds.

Ex nitric acid must be  $\text{HNO}_3$  because  $\text{H}^+$  and  $\text{NO}_3^-$  charges add up to zero.  
Ex sulfurous acid must be  $\text{H}_2\text{SO}_3$  because you must add two  $\text{H}^+$  ions to cancel out one  $\text{SO}_3^{2-}$  ion.

**BE CAREFULS:**

- Don't forget that most acids (all acids you have to name in 1<sup>st</sup> year chemistry) begin with an  $\text{H}^+$  ion and an anion that controls the formula.
- Acids are similar to salts in the way they're named.
- Remember the tricks to naming acids  
A. I **ATE** at the cafeteria and said **IC**  
B. The physician said I had appendicitis (appendic **ITE** - **OUS**)  
C. I'd hide Rick (**IDE HYDR O IC**)