

## Binary Molecular Nomenclature

- Bonding between two **nonmetals**
- Unlike ionic bonding, there are no charges to balance and therefore multiple subscripts can be possible (ex. NO, NO<sub>2</sub>, N<sub>2</sub>O<sub>2</sub>, etc)

### Naming rules

- When naming, use the following prefixes for the subscripts

1- mono  
2- di  
3- tri  
4- tetra  
5- penta

6- hexa  
7- hepta  
8- octa  
9- nona  
10- deca

- Change the second name to end in “-ide”
- Do not use prefixes if the prefix on the first word is mono
- ALWAYS use prefixes on the second name

Ex. SO<sub>2</sub> is sulfur dioxide (since there is only one sulfur atom, you do not use the prefix mono)  
N<sub>2</sub>O<sub>2</sub> is dinitrogen dioxide

### **\*\*NEVER USE PREFIXES WHEN NAMING A METAL\*\***

**Writing compounds:** Use the prefixes to write the subscripts of the molecule, but do *NOT* reduce the subscripts

### Try these:

1. NO
2. P<sub>2</sub>O<sub>5</sub>
3. CF<sub>4</sub>
4. SO<sub>2</sub>
5. CCl<sub>4</sub>
6. CO
7. N<sub>2</sub>O<sub>4</sub>
8. PCl<sub>5</sub>
9. SO<sub>3</sub>
10. SiO<sub>2</sub>

11. Nitrogen monoxide
12. Diphosphorus pentoxide
13. Carbon tetrafluoride
14. Sulfur dioxide
15. Carbon tetrachloride
16. Carbon monoxide
17. Dinitrogen tetraoxide
18. Phosphorus pentachloride
19. Sulfur trioxide
20. Silicon dioxide

## Polyatomic Ions

- Polyatomic ions are groups of atoms covalently bonded together that act as a single ion

Polyatomic ions you need to know (including charges!!):

- Ammonium:  $\text{NH}_4^+$ 
  - Nitrate:  $\text{NO}_3^-$
  - Hydroxide:  $\text{OH}^-$
  - Bicarbonate:  $\text{HCO}_3^-$
  - Permanganate:  $\text{MnO}_4^-$
- Acetate:  $\text{C}_2\text{H}_3\text{O}_2^-$
- Sulfate:  $\text{SO}_4^{2-}$
- Carbonate:  $\text{CO}_3^{2-}$
- Phosphate:  $\text{PO}_4^{3-}$

### Writing names

- Name the cation and then the anion
- If the polyatomic ion is an anion, simply name the polyatomic ion without the -ide ending
- Ex:  $\text{NaNO}_3$ 
  - There are more than two capital letters so it must have a polyatomic ion.
  - Name: Sodium nitrate
- Ex:  $\text{Al}_2(\text{SO}_4)_3$ 
  - Name: aluminum sulfate
- Ex:  $(\text{NH}_4)_3\text{PO}_4$ 
  - Name: ammonium phosphate

### Writing the formula

- Use the same rules as other ionic compounds. The rules of binary compounds and transition metals still apply.
- Ex: Iron (II) sulfate
  - Iron has a +2 charge, sulfate as a -2
  - Formula:  $\text{FeSO}_4$
- Ex: Iron (III) sulfate
  - Iron has a +3 charge, sulfate has a -2
  - Crisscross to get  $\text{Fe}_2\text{SO}_{43}$
  - Wait! You cannot have 43 oxygen atoms, so you must use parentheses
  - Formula:  $\text{Fe}_2(\text{SO}_4)_3$

Try these

- |                             |                                  |
|-----------------------------|----------------------------------|
| 1. Sodium nitrate           | 11. $\text{NaNO}_3$              |
| 2. Aluminum phosphate       | 12. $\text{AlPO}_4$              |
| 3. Potassium phosphate      | 13. $\text{K}_3\text{PO}_4$      |
| 4. Ammonium sulfide         | 14. $(\text{NH}_4)_2\text{S}$    |
| 5. Chromium (III) carbonate | 15. $\text{Cr}_2(\text{CO}_3)_3$ |
| 6. Magnesium hydroxide      | 16. $\text{Mg}(\text{OH})_2$     |
| 7. Cobalt (II) carbonate    | 17. $\text{CoCO}_3$              |
| 8. Iron (II) hydroxide      | 18. $\text{Fe}(\text{OH})_2$     |
| 9. Ammonium carbonate       | 19. $(\text{NH}_4)_2\text{CO}_3$ |
| 10. Zinc phosphate          | 20. $\text{Zn}_3(\text{PO}_4)_2$ |