

**16** **Chemical Names and Formulas**  
Skillsheet

**Understanding Chemical Terminology**

Chemical terminology refers to the process of naming chemicals. This skillsheet focuses on the most basic rules and ideas involved in the naming of compounds.

The simplest compounds contain just two elements. Sodium chloride, NaCl, is an example of a binary compound. Several other examples are listed below.

|                   |                   |
|-------------------|-------------------|
| Potassium bromide | KBr               |
| Calcium bromide   | CaBr <sub>2</sub> |
| Lithium fluoride  | LiF               |
| Lithium oxide     | Li <sub>2</sub> O |

In naming binary compounds, follow these rules:

1. The element with the positive ionic charge is written first.
2. The second word is formed by changing the ending of the name of the element to "ide." For example, bromine changes to bromide, fluorine changes to fluoride, and oxygen changes to oxide.

Metals usually have positive ionic charges, or states, while nonmetals (when combined with metals) have negative ionic charges.

**Practice Problems**

Using the rules given above, name the compounds listed below.

1. MgO      1. Magnesium oxide
2. BaS      2. Barium sulfide
3. K<sub>3</sub>P      3. Potassium Phosphide
4. Na<sub>3</sub>N      4. Sodium Nitride
5. Below are the symbols for selected elements. Choose the symbols of the elements that usually have positive ionic charges.  
 Fe C N Na Sr      5. Fe, Na, Sr  
 Se Mn Mg Al As      Sc, Mn, Mg  
 H O Ca Ag At      Al, Ca, As

Some transition metals have more than one positive ionic charge. Look at the formulas below.

|                   |                    |
|-------------------|--------------------|
| Cu <sub>2</sub> O | copper(I) oxide    |
| CuO               | copper(II) oxide   |
| FeCl <sub>2</sub> | iron(II) chloride  |
| FeCl <sub>3</sub> | iron(III) chloride |

Note that roman numerals follow the names of the positive elements. The numerals indicates the ionic charge of the element in the compound.

**Practice Problems**

Name the following compounds.

6. SnCl<sub>4</sub>      6. Tin (IV) chloride
7. Mn<sub>2</sub>O<sub>3</sub>      7. Manganese (III) oxide
8. PbS      8. Lead (II) sulfide
- 9) CaCO<sub>3</sub>      9. Calcium carbonate
- 10) Mg<sub>3</sub>P<sub>2</sub>      10. Magnesium Phosphide
- 11). Cu<sub>2</sub>O      11. Copper (I) oxide
- 12). FeO      12. Iron (II) oxide
- 13) CuS      13. Copper (II) sulfide
- 14) AgCl      14. Silver chloride

Write the formula for the following compounds.

Name \_\_\_\_\_

Formulas

1. sodium chloride  $\text{NaCl}$
2. ammonium hydroxide  $\text{NH}_4\text{OH}$
3. calcium sulfate  $\text{CaSO}_4$
4. magnesium nitrate  $\text{Mg}(\text{NO}_3)_2$
5. aluminum phosphate  $\text{AlPO}_4$
6. zinc chloride  $\text{ZnCl}_2$
7. mercury(II) oxide  $\text{HgO}$
8. aluminum sulfate  $\text{Al}_2(\text{SO}_4)_3$
9. silver nitrate  $\text{AgNO}_3$
10. barium hydroxide  $\text{Ba}(\text{OH})_2$
11. potassium sulfide  $\text{K}_2\text{S}$
12. iron(II) sulfate  $\text{FeSO}_4$
13. mercury(I) chloride  $\text{Hg}_2\text{Cl}_2$
14. copper<sup>(II)</sup> carbonate  $\text{Cu}_2\text{CO}_3$
15. calcium acetate  $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
16. iron(III) sulfate  $\text{Fe}_2(\text{SO}_4)_3$
17. calcium phosphate  $\text{Ca}_3(\text{PO}_4)_2$
18. zinc sulfide  $\text{ZnS}$
19. ammonium carbonate  $(\text{NH}_4)_2\text{CO}_3$
20. antimony<sup>(III)</sup> chloride  $\text{SbCl}_3$
21. potassium oxide  $\text{K}_2\text{O}$
22. ammonium sulfide  $(\text{NH}_4)_2\text{S}$
23. mercuric nitrate  $\text{Hg}(\text{NO}_3)_2$
24. iron(III) chloride  $\text{FeCl}_3$
25. aluminum oxide  $\text{Al}_2\text{O}_3$
26. Gold (III) sulfate  $\text{Au}_2(\text{SO}_4)_3$
- 27.) Calcium hydroxide  $\text{Ca}(\text{OH})_2$
- 28.) magnesium nitrate  $\text{Mg}(\text{NO}_3)_2$
- 29.) Potassium Nitride  $\text{K}_3\text{N}$
- 30.) Cobalt (III) iodide  $\text{CoI}_3$

Some nonmetallic elements may form more than one compound with another nonmetal. The names of these compounds must show the differences between them. Look at the following examples.

|                               |                         |
|-------------------------------|-------------------------|
| CO                            | carbon monoxide         |
| CO <sub>2</sub>               | carbon dioxide          |
| SO <sub>2</sub>               | sulfur dioxide          |
| SO <sub>3</sub>               | sulfur trioxide         |
| N <sub>2</sub> H <sub>4</sub> | dinitrogen tetrahydride |

In the examples, the prefixes mono-, di-, tri-, and tetra- indicate the number of atoms of the nonmetal in the molecule. These and other prefixes with their meanings are listed below. Note that prefixes are not used when naming compounds formed between a metal and a nonmetal.

|        |       |        |       |
|--------|-------|--------|-------|
| mono-  | one   | hexa-  | six   |
| di-    | two   | hepta- | seven |
| tri-   | three | octa-  | eight |
| tetra- | four  | nona-  | nine  |
| penta- | five  | deca-  | ten   |

Name: \_\_\_\_\_

Write formulas for the following compounds.

1) Diphosphorus pentoxide  
P<sub>2</sub>O<sub>5</sub>

2) Sulfur hexafluoride  
SF<sub>6</sub>

3) Dichlorine heptoxide  
Cl<sub>2</sub>O<sub>7</sub>

4) Carbon tetrafluoride  
CF<sub>4</sub>

Name the following compounds

- |                                  |                                     |
|----------------------------------|-------------------------------------|
| 1. CO                            | 1. <u>Carbon monoxide</u>           |
| 2. CO <sub>2</sub>               | 2. <u>Carbon dioxide</u>            |
| 3. SO <sub>3</sub>               | 3. <u>Sulfur trioxide</u>           |
| 4. CCl <sub>4</sub>              | 4. <u>Carbon tetrachloride</u>      |
| 5. PCl <sub>5</sub>              | 5. <u>Phosphorous Pentachloride</u> |
| 6. N <sub>2</sub> O <sub>3</sub> | 6. <u>dinitrogen trioxide</u>       |
| 7. SO <sub>2</sub>               | 7. <u>Sulfur dioxide</u>            |
| 8. N <sub>2</sub> O <sub>4</sub> | 8. <u>dinitrogen tetroxide</u>      |
| 9. NO                            | 9. <u>Nitrogen monoxide</u>         |
| 10. N <sub>2</sub> O             | 10. <u>dinitrogen monoxide</u>      |

**Practice Problems**

Name the following compounds.

1.  $N_2O_3$  dinitrogen trioxide
2.  $PCl_3$  phosphorous trichloride
3.  $SiO_2$  silicon dioxide
4.  $P_2O_5$  diphosphorous pentoxide
5.  $CS_2$  Carbon disulfide
6.  $Al_2O_3$  aluminium oxide
7.  $BaSO_4$  Barium sulfate
8.  $BaSO_3$  Barium sulfite
9.  $Na_2CO_3$  sodium carbonate
10.  $NaHCO_3$  sodium bicarbonate
11.  $(NH_4)_3PO_4$  ammonium phosphate
12.  $NH_4OH$  ammonium hydroxide
13.  $LiCl$  Lithium chloride
14.  $KBr$  potassium bromide
15.  $CsF$  Cesium fluoride
16.  $BaF$  Barium fluoride
17.  $ZnO$  Zinc oxide
18.  $MnO_2$  manganese(IV) oxide
19.  $HgO$  mercury(II) oxide
20.  $FeCl_3$  Iron(III) chloride

**Practice Problems**

Name or give the formula for the following. Label ionic or covalent

21. Iron(III) chloride I  $FeCl_3$  ionic
22. Silver acetate I  $AgC_2H_3O_2$  covalent
23.  $Ca(OH)_2$  I calcium hydroxide
24.  $CCl_4$  carbon tetrachloride covalent
25. Mercury(II) oxide I  $HgO$
26.  $NaClO_3$  I sodium chlorate
27.  $(NH_4)_2SO_4$  I ammonium sulfate
28.  $Fe_2S_3$  I Iron(III) sulfide
29. oxygen difluoride C  $OF_2$
30. sodium sulfide I  $Na_2S$
31.  $K_2SO_4$  I potassium sulfate
32.  $SCl_2$  C sulfur dichloride
33.  $MgCl_2$  I magnesium chloride
34. tetraiodine nonoxide C  $I_4O_9$
35.  $CS_2$  C carbon disulfide
36.  $ZnCO_3$  I Zinc carbonate