

## Review: Chemical Compounds

### Part 1 — Ionic or Covalent?

The first step in writing the formula/name of a compound is determining whether the compound is ionic or covalent. This is done by looking at the types of elements present in the compound.

1. What types of elements combine to form an ionic compound?
2. What types of elements combine to form a covalent compound?
3. State whether each of the following compounds is ionic or covalent.

- |                     |                   |
|---------------------|-------------------|
| a) sodium sulfide   | e) $MgI_2$        |
| b) $PCl_3$          | f) sodium nitrate |
| c) nitrogen dioxide | g) $CH_4$         |
| d) zinc oxide       | h) $K_2CO_3$      |

### Part 2 — Binary or Polyatomic?

Once you have determined that a compound is ionic, the next step is to decide if it is binary or polyatomic. This is done by counting how many different elements are present in the compound.

4. How many different elements are there in a binary ionic compound?
5. How many different elements are there in a polyatomic ionic compound?
6. State whether each of the following compounds is binary or polyatomic.

- |                      |                        |
|----------------------|------------------------|
| a) $NaNO_3$          | e) potassium carbonate |
| b) magnesium sulfate | f) $NaCH_3COO$         |
| c) sodium chloride   | g) lithium sulfide     |
| d) $MgBr_2$          | h) ammonium sulfite    |

If there is a polyatomic ion present in a compound, you need to be able to identify it. This is done by looking it up on the table in your data booklet (see the table on page 3).

7. For each of the following compounds, identify the polyatomic ion.

a) $Na_2CO_3$	e) $AgNO_2$
b) aluminum sulfate	f) calcium phosphate
c) barium nitrate	g) ammonium hydroxide
d) $CaCO_3$	

### Part 3 — Ionic Charge

In order to write formulas for ionic compounds, you need to know the charges on the two ions present in the compound. This is done either by memorizing rules (e.g. all Alkali Metals are +1) or by looking the ion up in your data booklet (see the table on page 3).

8. What is the charge on each of the following ions?

- |             |              |              |
|-------------|--------------|--------------|
| a) lithium  | g) copper(I) | m) lead(IV)  |
| b) sulfide  | h) sulfate   | n) hydroxide |
| c) acetate  | i) aluminum  | o) bromide   |
| d) calcium  | j) phosphide | p) hydrogen  |
| e) iron(II) | k) phosphate | q) tin(II)   |
| f) oxide    | l) silver    | r) chlorite  |

### Part 4 — Ionic Compounds are Neutral

The total charge on an ionic compound is zero. In other words, the total charge on the positive ions has to equal the total charge on the negative ions. You can determine if a formula is correct by adding up its total charge. If it is not zero, the formula is not correct.

E.g. In the compound  $CaCl_2$ , the one calcium ion is +2 while the two chloride ions are -1 each (for a total of -2). Since  $(+2) + (-2) = 0$ , the formula is correct.

9. For each of the following compounds, determine whether the formula is correct or not. If it is not, then write the correct formula.

- |           |             |
|-----------|-------------|
| a) $LiO$  | d) $AlBr_3$ |
| b) $MgO$  | e) $KN_3$   |
| c) $K_2S$ | f) $KCO_3$  |

### Part 5 — Prefixes

In order to write names and formulas for covalent compounds, you need to know the prefixes that represent the number of atoms of an element that are present in the compound. It is necessary to memorize them.

10. What is the prefix for each of the following numbers?

- |          |         |          |
|----------|---------|----------|
| a) one   | d) four | g) seven |
| b) two   | e) five | h) eight |
| c) three | f) six  | i) nine  |

### Part 6 — Writing Formulas from Names (Ionic)

The formulas for ionic compounds are determined using the crisscross method, or by balancing the charges mathematically. Remember that you must first determine if the compound is binary or polyatomic. If it is polyatomic, you will have to look up the ion's formula and charge on page 3 of your data booklet.

11. Write the correct formula for each of the following compounds.

- |                       |                           |
|-----------------------|---------------------------|
| a) potassium fluoride | f) lithium cyanide        |
| b) ammonium sulfate   | g) lithium acetate        |
| c) magnesium iodide   | h) beryllium oxide        |
| d) aluminum phosphate | i) potassium permanganate |
| e) silver cyanide     | j) aluminum arsenide      |

Certain elements form more than one type of ion. In these cases, their name will include a roman numeral. The roman numeral tells you the charge on the metal ion. (e.g. copper(I) means copper with a +1 charge)

12. Write the correct formula for each of the following compounds.

- |                           |                         |
|---------------------------|-------------------------|
| a) copper(II) sulfite     | e) lead(IV) sulfite     |
| b) lead(II) nitrite       | f) copper(II) chloride  |
| c) copper(II) bicarbonate | g) chromium(VI) cyanide |
| d) iron(II) oxide         | h) tin(II) sulfite      |

### Part 7 — Writing Formulas from Names (Covalent)

Covalent compounds are generally easier to work with, since the prefixes tell you exactly how many atoms of each element are present. (e.g. diphosphorus means  $P_2$ )

13. Write the correct formula for each of the following compounds.

- |                           |                         |
|---------------------------|-------------------------|
| a) dihydrogen monoxide    | e) iodine trichloride   |
| b) carbon dioxide         | f) nitrogen triiodide   |
| c) carbon tetrahydride    | g) diarsenic pentoxide  |
| d) diphosphorus pentoxide | h) dinitrogen tetroxide |

### Part 8 — Writing Names from Formulas (Ionic)

The basic rule for naming is:

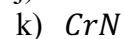
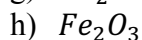
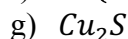
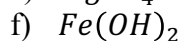
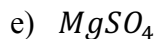
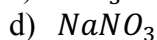
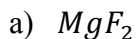
name of metal + name of non-metal with ending changed to ide

For example,  $NaCl$  would be called sodium chloride.

If the compound contains a polyatomic ion, you use the name of the polyatomic ion without changing the ending. For example,  $NaOH$  would be called sodium hydroxide.

If the compound contains a metal that needs a roman numeral (see the table on page 3 of your data booklet), you must include one in your answer. For example,  $FeO$  would be called iron(II) oxide.

14. Write the correct name for each of the following compounds.



### Part 9 — Writing Names from Formulas (Covalent)

The basic rule for naming is

prefix + name of first element + prefix + name of second element with ending changed to ide

The prefixes are determined by looking at the subscript attached to each element's symbol. For example,  $P_2O_5$  would be called diphosphorus pentoxide.

15. Write the correct name for each of the following compounds.

