

Introduction to Naming Compounds and Writing Formulas

Part I: Nomenclature of Binary Ionic Compounds Composed of Main Group Elements

Part I focuses on the nomenclature rules for ionic compounds composed of two different elements from the main group on the periodic table of the elements.

Observing the Patterns:

Consider the following group of formulas and their corresponding names. Examine the formulas and names carefully to identify patterns associated with naming these compounds. Use only a periodic table as a reference.

Chemical Formula	Compound Name
CaO	calcium oxide
Li ₃ N	lithium nitride
AlCl ₃	aluminum chloride
Sr ₃ P ₂	strontium phosphide
KCl	Potassium chloride

1. In your notebook, write down the patterns you observe in both the chemical formula and name for the compounds above.
2. Use the patterns you observed to construct a set of rules for the nomenclature of binary (2-element) ionic compounds composed of main group elements. Be sure that rules you establish can be used to work from the chemical formula to the written form and vice versa. Write these rules in your notebook.

Now it's time for some practice!

3. Use the rules you have determined above to write the formulas of the binary ionic compounds listed below. Do these without using any outside resources.
 - a. sodium bromide
 - b. beryllium chloride
 - c. calcium selenide
 - d. magnesium sulfide
 - e. aluminum oxide
 - f. lithium phosphide
 - g. cesium arsenide
 - h. gallium selenide
4. Use the rules you have determined to write the names of the following binary ionic compounds listed below. Do these without using any outside resources.
 - a. Na₂O
 - b. RbI
 - c. LiBr
 - d. CaF₂
 - e. Cs₃P
 - f. MgO
 - g. Ga₂O₃

Part II - Binary Ionic Compounds Containing Transition Metals.

The part of the nomenclature system in Part I is used to name binary ionic compounds composed of main group elements. However, there are other binary ionic compounds that contain transition metals, which can exist with more than one charge.

Consider the following group of formulas and their corresponding names. Examine the formulas and names carefully to identify patterns associated with naming compounds. Use only a periodic table as a reference.

Chemical Formula	Compound Name
Fe ₂ O ₃	iron(III) oxide
FeCl ₂	iron(II) chloride
PbO ₂	lead(IV) oxide
CuSe	copper(II) selenide
KCl	potassium chloride
SnF ₄	tin(IV) fluoride
NbCl ₅	niobium(V) chloride

1. Write down the patterns you observe in both the chemical formula and name for the compounds above in your notebook.
2. Use the patterns you observed to construct a set of rules for the nomenclature of **all** binary ionic compounds. Be certain that your rules can be used to work from formula to name and vice versa. Record your rules in your notebook.

3. Use the rules you have determined above to write the formulas of the binary ionic compounds listed below. Do these exercises without using any outside resources.
 - a. cobalt(III) chloride
 - b. lithium arsenide
 - c. platinum(IV) fluoride
 - d. nickel(II) sulfide
 - e. chromium(III) oxide
 - f. beryllium nitride
 - g. titanium(II) chloride
 - h. iron(III) iodide
4. Use the rules you have determined to write the names of the following binary ionic compounds listed below. Do these exercises without using any outside resources.
 - a. MnF₂
 - b. Ni₃P₂
 - c. PbS₂
 - d. Cs₂S
 - e. ScCl₃
 - f. MgI₂
 - g. PbS
 - h. CuSe

Part III- Ionic Compounds Containing Polyatomic Ions.

The chemical nomenclature system was introduced in Part I and further developed in Part II. Both of these activities limited themselves to ionic compounds composed only of two elements (binary ionic compounds). Part III introduces polyatomic ions, or ions containing two or more atoms bonded and with a charge. Keep in mind what you have learned in parts I and II as you investigate part III. Use the list of polyatomic ions on your resource sheet to assist you.

Consider the following group of formulas and their corresponding names. Examine the formulas and names carefully to identify patterns associated with naming compounds. Use only a periodic table as a reference.

Chemical Formula	Compound Name
$(\text{NH}_4)_2\text{S}$	ammonium sulfide
CoSO_4	cobalt(II) sulfate
$\text{Fe}(\text{OH})_3$	iron(III) hydroxide
$\text{Ca}_3(\text{PO}_4)_2$	calcium phosphate
NH_4NO_3	ammonium nitrate

- Write down the patterns you observe in both the chemical formula and name for the compounds above in your notebook.
- Use the patterns you observed to construct a set of rules for the nomenclature of ionic compounds containing a polyatomic ion. Be certain that your rules can be used to work from formula to name and vice versa. Record your rules in your notebook.
- Use the rules you have determined to write the formulas of the binary ionic compounds listed below. Again, no outside resources.
 - iron(III) acetate
 - aluminum hydroxide
 - strontium sulfate
 - lead(II) carbonate
 - copper(I) phosphite
 - ammonium nitride
 - potassium cyanide
 - magnesium arsenate
- Use the rules you have determined to write the names of the following binary ionic compounds.
 - $\text{Cu}(\text{OH})_2$
 - $\text{Sn}(\text{C}_2\text{H}_3\text{O}_2)_2$
 - $\text{Zn}_3(\text{PO}_4)_2$
 - $\text{Pb}(\text{NO}_3)_2$
 - NaHCO_3
 - FeCO_3
 - NH_4F
 - MgSO_4

Part IV: Binary Compounds of the Nonmetals

Parts I-III have introduced the naming system and its use in ionic compounds. The rules for naming binary compounds composed of only nonmetals are different, and will be investigated in part IV.

Consider the following group of formulas and their corresponding names. Examine the formulas and names carefully to identify patterns associated with naming molecules. Use only a periodic table as a reference.

Chemical Formula	Compound Name
NO	nitrogen monoxide
N ₂ O	dinitrogen monoxide
NO ₂	nitrogen dioxide
N ₂ O ₄	dinitrogen tetroxide
NF ₃	nitrogen trifluoride

1. Write down the patterns you observe in both the chemical formula and name for the compounds above in your notebook.
2. Use the patterns you observed to construct a set of rules for the nomenclature of **all** binary molecular compounds. Be certain that your rules can be used to work from formula to name and vice versa. Record your rules in your notebook.

3. Use the rules you have determined above to write the formulas of the following molecular compounds.
 - a. carbon tetrachloride
 - b. dihydrogen monosulfide
 - c. phosphorus triiodide
 - d. sulfur dibromide
 - e. boron trifluoride
 - f. dioxygen difluoride
 - g. tetraphosphorus decaoxide
 - h. sulfur hexafluoride
4. Use the rules you have determined to write the names of the following molecules.
 - a. N₂H₄
 - b. OF₂
 - c. SBr₂
 - d. BCl₃
 - e. XeF₄
 - f. ClF₃
 - g. P₄O₃
 - h. CS₂