

Simple Ionic Compounds Naming

- Simple ionic compounds are composed of a metal and a non-metal.
- Ionic bonds involve the transfer of electrons from one atom to another, creating ions.

RULES:

1. Metallic element is always named first.
2. Non-metallic element named second (lower case), and its ending is changed to "ide".

Example:

CaF_2	Calcium fluoride
Na_2O	sodium oxide

Practice:

Name the compound formed by:

- | | |
|--------------------|--------------------|
| 1. Na and Cl _____ | 6. Al and I _____ |
| 2. K and I _____ | 7. S and Ba _____ |
| 3. Ca and C _____ | 8. Al and P _____ |
| 4. N and Mg _____ | 9. Br and Ba _____ |
| 5. O and Ba _____ | 10. K and O _____ |

Name the following compounds:

- | | |
|----------------------------------|----------------------------------|
| 1. NaF _____ | 9. Al_2O_3 _____ |
| 2. K_2O _____ | 10. Na_4C _____ |
| 3. Ca_3N_2 _____ | 11. AlP _____ |
| 4. BaCl_2 _____ | 12. NaI _____ |
| 5. Na_2S _____ | 13. KBr _____ |
| 6. Ca_3P_2 _____ | 14. AlF_3 _____ |
| 7. K_3P _____ | 15. BaO _____ |
| 8. BaI_2 _____ | 16. K_3N _____ |

Simple Ionic Compounds Writing Formulae

- Writing formulae for simple ionic compounds requires that you know the combining capacity of the elements involved.

RULES:

1. Write the symbol and the combining capacity for the metallic element first.
2. Write the symbol and the combining capacity for the non-metallic element second.
3. Criss-cross the combining capacities and reduce to the lowest common multiple.

Example:

Name	Criss-cross	Formula	Simplify
Calcium nitride	$\text{Ca}^{+2} \quad \text{N}^{-3}$	Ca_3N_2	
Magnesium oxide	$\text{Mg}^{+2} \quad \text{O}^{-2}$	Mg_2O_2	MgO

Practice:

Give the formula for the following:

- | | |
|-----------------------------|---|
| 1. Sodium iodide _____ | 9. Rubidium telluride _____ |
| 2. Potassium oxide _____ | 10. Radium phosphide _____ |
| 3. Barium nitride _____ | 11. Calcium chloride _____ |
| 4. Francium sulphide _____ | 12. Magnesium sulphide _____ |
| 5. Cesium phosphide _____ | 13. Potassium bromide _____ |
| 6. Lithium fluoride _____ | 14. Aluminum oxide _____ |
| 7. Beryllium sulphide _____ | 15. Zinc chloride <u>Zn²⁺ Cl⁻=ZnCl₂</u> |
| 8. Strontium selenide _____ | 16. Potassium nitride _____ |

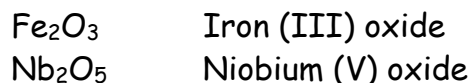
Multi-valent Metals / Transition Metals Naming

- Many transition metals, found in the centre block of the periodic table, have more than one possible combining capacity.
- They are therefore called multi-valent.

RULES:

1. Metallic element is always named first, followed by the combining capacity being used in Roman Numerals.
2. Non-metallic element named second (lower case), and its ending is changed to "ide".

Example:



Hint: "Un-criss-crossing" the combining capacities may help!

Practice:

Name the following compounds:



Multi-valent Metals / Transition Metals Writing Formulae

- The only difference between these compounds and other ionic compounds is that the combining capacity of the metal is given to you in Roman Numerals following the name of the metal.

RULES:

- Write the symbol and the combining capacity for the metallic element first.
- Write the symbol and the combining capacity for the non-metallic element second.
- Criss-cross the combining capacities and reduce to the lowest common multiple.

Example:

Name	Criss-cross	Formula	Simplify
Gold (III) oxide	$\text{Au}^{+3} \quad \text{O}^{-2}$	Au_2O_3	
Chromium (II) sulphide	$\text{Cr}^{+2} \quad \text{S}^{-2}$	Cr_2S_2	CrS

Practice:

Give the formula for the following:

- Manganese (IV) oxide **MnO₂**
- Cobalt (III) nitride _____
- Palladium (IV) bromide _____
- Osmium (III) selenide _____
- Plutonium (VI) sulphide _____
- Rhenium (VII) arsenide _____
- Mercury (II) oxide _____
- Polonium (IV) astatide _____
- Thallium (III) phosphide _____
- Antimony (V) telluride _____
- Lead (IV) oxide _____
- Cobalt (II) chloride _____
- Nickel (III) sulphide **Ni₂S₃**
- Niobium (V) phosphide _____

Polyatomic Ions Naming

- Polyatomic ions are groups of tightly bound atoms with an overall ionic charge that behave as if they were a single metallic or non-metallic ion during chemical changes.

TABLE 2.3 Some Common Polyatomic Ions			
Formula	Name	Formula	Name
<i>Cation</i>		<i>Singly charged anions (continued)</i>	
NH_4^+	Ammonium	NO_2^-	Nitrite
<i>Singly charged anions</i>		NO_3^-	Nitrate
CH_3CO_2^-	Acetate	<i>Doubly charged anions</i>	
CN^-	Cyanide	CO_3^{2-}	Carbonate
ClO^-	Hypochlorite	CrO_4^{2-}	Chromate
ClO_2^-	Chlorite	$\text{Cr}_2\text{O}_7^{2-}$	Dichromate
ClO_3^-	Chlorate	O_2^{2-}	Peroxide
ClO_4^-	Perchlorate	HPO_4^{2-}	Hydrogen phosphate
H_2PO_4^-	Dihydrogen phosphate	SO_3^{2-}	Sulfite
HCO_3^-	Hydrogen carbonate (or bicarbonate)	SO_4^{2-}	Sulfate
HSO_4^-	Hydrogen sulfate (or bisulfate)	$\text{S}_2\text{O}_3^{2-}$	Thiosulfate
OH^-	Hydroxide	<i>Triply charged anion</i>	
MnO_4^-	Permanganate	PO_4^{3-}	Phosphate

RULES:

1. Follow regular naming rules except that the name of the polyatomic ion is never changed.

Example:

$\text{Mg}(\text{NO}_3)_2$	Magnesium nitrate
NH_4Cl	Ammonium chloride
$\text{Pb}(\text{NO}_3)_2$	Lead (II) nitrate

Practice:

Name the following compounds:

- | | |
|--|--|
| 1. NaOH <u>sodium hydroxide</u> | 9. NaHSO_4 _____ |
| 2. CaCO_3 _____ | 10. NH_4Br _____ |
| 3. KClO_3 _____ | 11. Na_2SO_4 _____ |
| 4. NaHCO_3 _____ | 12. $\text{Ba}(\text{OH})_2$ _____ |
| 5. AlPO_4 _____ | 13. $\text{Fe}(\text{NO}_2)_3$ _____ |
| 6. AuClO_3 _____ | 14. $(\text{NH}_4)_2\text{O}$ _____ |
| 7. NiPO_4 _____ | 15. MgSO_4 <u>Magnesium sulfate</u> |
| 8. $\text{K}_2\text{Cr}_2\text{O}_7$ _____ | 16. CuSO_4 _____ |

Polyatomic Ions Writing Formulae

- Writing formulae for these compounds is not much different than writing formulae for regular ionic compounds. The rules are basically the same with a few additions.

RULES:

1. Write the symbol and the combining capacity for the metallic element first or the polyatomic ion ammonium if present.
2. Write the symbol and the combining capacity for the negative polyatomic ion second.
3. Criss-cross the combining capacities and reduce to the lowest common multiple.
4. Remember to use brackets if there is more than one group of the polyatomic ion.

Example:

Name	Criss-cross	Formula
Ammonium nitride	$\text{NH}_4^{+1} \quad \text{N}^{-3}$	$(\text{NH}_4)_3\text{N}$
Sodium carbonate	$\text{Na}^{+1} \quad \text{CO}_3^{-2}$	Na_2CO_3

Practice:

Give the formula for the following:

- | | |
|---------------------------|------------------------|
| 1. Cadmium nitrate | <u>Cd(NO3)2</u> |
| 2. Strontium phosphate | _____ |
| 3. Ammonium sulphide | _____ |
| 4. Magnesium chlorate | _____ |
| 5. Barium sulphate | _____ |
| 6. Cesium bicarbonate | _____ |
| 7. Calcium hydroxide | _____ |
| 8. Ammonium dichromate | _____ |
| 9. Lithium carbonate | _____ |
| 10. Aluminum bisulphate | _____ |
| 11. Lead (IV) sulphite | _____ |
| 12. Cobalt (III) cyanide | _____ |
| 13. Chromium (VI) acetate | _____ |
| 14. Ammonium phosphate | _____ |

Hydrates Naming & Formulae

- hydrates are molecules which include water molecules in their crystal structure
- they are created when a crystal of an ionic compound is grown by evaporation from an aqueous solution
- name the compound as normal then add a prefix to describe how many water molecules are attached with the word "hydrate"

Number	Greek Prefix	Number	Greek Prefix
1	mono	6	hexa
2	di	7	hepta
3	tri	8	octa
4	tetra	9	nona
5	penta	10	deca

ex. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ = copper (II) sulphate pentahydrate
 $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ = zinc acetate dihydrate

◆ Name the following hydrated compounds:

- a. $\text{FeBr}_3 \cdot 6\text{H}_2\text{O}$ _____
- b. $\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ _____
- c. $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ _____
- d. $\text{CoF}_2 \cdot 4\text{H}_2\text{O}$ _____
- e. $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ _____

◆ Write the formula for the following hydrated compounds:

- a. iron (III) phosphate octahydrate _____
- b. cadmium (II) nitrate tetrahydrate _____
- c. copper (II) phosphate trihydrate _____
- d. chromium (II) oxalate monohydrate _____
- e. aluminum nitrate nonahydrate _____