

Naming Compounds

DHMO
KILLS

Dangers:

- Death by inhalation
- Corrodes metals
- Bloating & nausea
- Electrical short-circuit
- Tissue damage & burns
- Soil erosion
- Brake failure
- Disaster & destruction

Uses:

- Animal research
- Abortion clinics
- Nuclear plants
- Chemical warfare
- Performance enhancers
- Torture
- Cult rituals
- Fire suppression

Places:

- Cancerous tumors
- Cleaning solvents
- Prisons & hospitals
- Acid rain
- Pharmaceuticals
- Lakes & streams
- Industrial waste
- Baby food & beer

Ban Dihydrogen Monoxide

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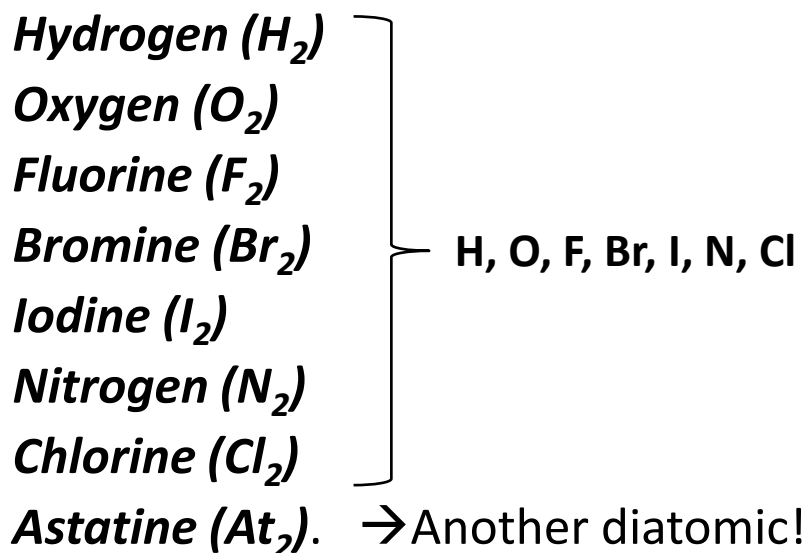
Outcome:

2-03 Write formulas and names for binary ionic compounds.

2-04 Write formulas and names for covalent compounds.

Elemental Molecules:

- You are responsible for knowing the **DIATOMIC** molecules.
- **DIATOMIC Molecules** contain **2 ATOMS** of the **SAME ELEMENT**, and are **NEVER** found as **SINGLE ATOMS**.



NOTE:

Some elements can also exist as **POLYATOMIC MOLECULES** like S₈ (*Sulfur*) and P₄ (*Phosphorus*)

Naming Compounds

We use a standard system of naming (**IUPAC** – International Union of Pure and Applied Chemistry) to name all chemical compounds.

There is a different way to name chemicals depending on whether they are **ionic** or **covalent**

Covalent Bonds	Ionic Bonds
<ul style="list-style-type: none">- Two <u>NON-METALS</u>- Is a <u>SHARING</u> of electrons	<ul style="list-style-type: none">- A <u>METAL</u> and a <u>NON-METAL</u>- Electrons are <u>TRANSFERRED</u>
Ex) <i>CCl₄, CO₂, NO₂</i>	Ex) <i>NaCl, CaS, MgH₂</i>

Naming COVALENT Compounds

Writing COVALENT names from formulas:

- We use a **PREFIX** system of **NOMENCLATURE** to name covalent compounds to show the number of each kind of atom:

<i>mono = 1</i>	<i>hexa = 6</i>
<i>di = 2</i>	<i>hepta = 7</i>
<i>tri = 3</i>	<i>octa = 8</i>
<i>tetra = 4</i>	<i>nona = 9</i>
<i>penta = 5</i>	<i>deca = 10</i>

Rules:

- The **1st element** is named in **FULL**, using **PREFIXES** only when there **MORE** than **2 ATOMS** (mono is understood).
- The **SECOND** element is **SHORTENED** and given an **“IDE”** suffix, and the appropriate **PREFIX**.

Naming COVALENT Compounds

Writing COVALENT names from formulas:

Examples:

CO → Carbon monoxide

CO₂ → Carbon dioxide

SF₆ → Sulphur hexafluoride

N₂O₅ → dinitrogen pentoxide

NO₃ → nitrogen trioxide

Formulas of COVALENT compounds

To find the **FORMULA** of a **COVALENT** compound, simply write the **SYMBOL** and the **NUMBER** of each atom (**SUBSCRIPT**) in the order that they are in the name.

Examples:

Sulphur dioxide →



Trinitrogen heptoxide →



Dihydrogen Monoxide →



Naming COVALENT compounds

Try these ones...

Formula	Name
PBr ₃	
S ₂ O ₂	
N ₃ O ₇	

Name	Formula
Dinitrogen trioxide	
Carbon tetrachloride	
Diphosphorus trisulphide	

Naming **BINARY IONIC** Compounds

*Writing **IONIC** names from formulas:*

When naming any ionic compound the name of the **CATION** (**POSITIVE** ion) is written first, followed by the name of the **ANION** (**NEGATIVE** ion).

→ See “**COMMON ION**” Side of the **PERIODIC TABLE**.

Rules:

1. Name the **CATION** by writing the **FULL NAME** of the **METALLIC** element.
2. Name the **ANION** by **ABBREVIATING** the full name of the **NON-METALLIC** element and adding the suffix “**IDE**”.

→ **NO PREFIXES!!!!** They are not needed!

Naming BINARY IONIC Compounds

Examples:

$\text{NaCl} \rightarrow$ Sodium Chloride

$\text{ZnBr}_2 \rightarrow$ Zinc Bromide

$\text{Al}_2\text{O}_3 \rightarrow$ Aluminum oxide

Formulas of BINARY IONIC Compounds

- Write the chemical **SYMBOL** of each element present.
- Use your periodic table to obtain the **CHARGES** on each atom involved in the ionic bond.
- **COMBINE** the atoms so the **CHARGES NEUTRALIZE** and the resulting compound is **NEUTRAL**. (*criss-cross method or lowest common multiple*)

Examples:

Magnesium chloride:

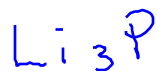
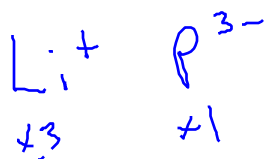
- ***Mg*** and ***Cl***
- ***Mg*** has a charge of **2+**, ***Cl*** has a charge of **1-**.
- When **TWO** ***Cl***⁻ ions combine with **ONE** ***Mg***²⁺ ion, the overall charge is **ZERO**, therefore ***MgCl***₂ is a **NEUTRAL** compound.

Formulas of IONIC compounds

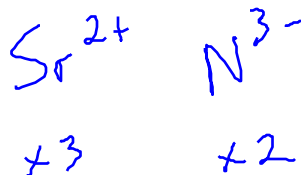
More Examples:

Write formulas for the following binary ionic compounds

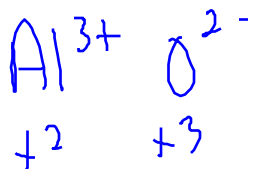
Lithium Phosphide



Strontium Nitride



Aluminum Oxide



Naming IONIC compounds

Try these ones...

Formula	Name
KBr	Potassium Bromide
CaCl ₂	Calcium Chloride
SrCl ₂	Strontium Chloride
Li ₂ O	Lithium oxide.

Name	Formula
Beryllium phosphide $\text{Be}^{2+} \text{P}^{3-}$	Be_3P_2
Aluminum sulphide $\text{Al}^{3+} \text{S}^{2-}$	Al_2S_3
Cadmium oxide	
Strontium iodide $\text{Sr}^{2+} \text{I}^-$	SrI_2

omit

Naming With Transition Metals

- You may have noticed that some ions have **ROMAN NUMERALS** after their names. These indicate different **OXIDATION STATES** – more on this in grade 12...
- To put it simply, some metals can arranging their **ELECTRONS** in different ways to become stable, which results in form **TWO** or **MORE** possible **IONS** (ex. iron $\rightarrow \text{Fe}^{2+}$ or Fe^{3+})
- These elements are called the **TRANSITION METALS** and can be found in the **CENTER** of the periodic table.

How do we know which ion to use???

To show which ion is present we use **ROMAN NUMERALS** in **BRACKETS**:

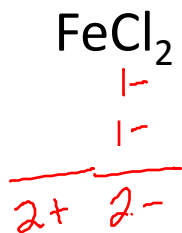
Example:



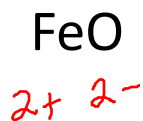
Naming IONIC Compounds with Transition Metals

We use the same rules as with binary ionic compounds, but we include the ROMAN NUMERALS to identify the CHARGE on the METAL.

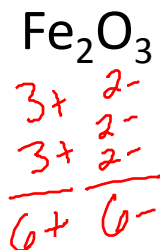
Examples:



Iron(II) chloride



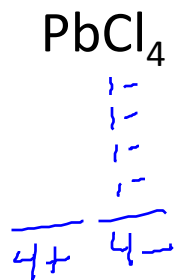
Iron(II) oxide



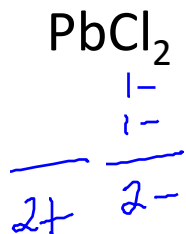
Iron(III) oxide

Try these ones...

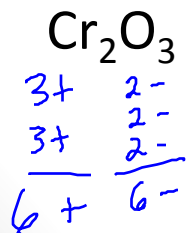
Name the following ionic compounds with transition metals



Lead(IV) Chloride



Lead(II) Chloride



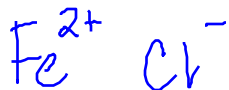
Chromium(III) oxide

Formulas of Compounds with Transition Metals:

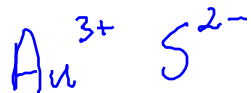
This follows the same rules as **BINARY IONIC** compounds from the previous lesson. Be sure to use the **CORRECT CHARGE** in the **POSITIVE** ion.

Example:

Iron (II) chloride



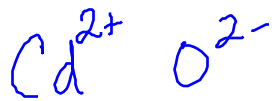
Gold (III) sulphide



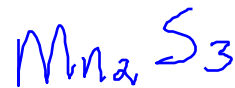
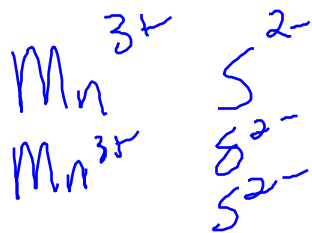
Try these ones...

Write formulas for the following ionic compounds with transition metals

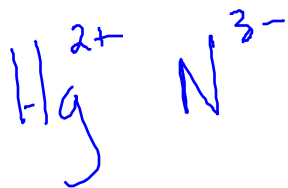
Cadmium (II) Oxide



Manganese (III) sulphide



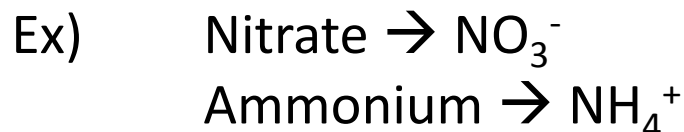
Mercury (II) Nitride



Extension:

Naming With Complex Ions

Complex ions are **GROUPS** of atoms made **STABLE** by **SHARING ELECTRONS**, which then become even more **STABLE** by **GAINING** or **LOSING ELECTRONS**.



Unlike **NEUTRAL** molecules, complex ions carry an **ELECTRIC CHARGE** and do not exist by themselves.

We follow the naming rules for **BINARY IONIC** compounds, but we treat the complex ion as a single ion.

Naming with Complex Ions

The **COMPLEX** part(s) of the ion are **NAMED** according to the “ion” side of the periodic table.

Note:

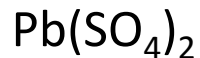
You may see the following names for complex ions:

→ ***Bicarbonate*** = HCO_3^- (**HYDROGEN CARBONATE**)

→ ***Bisulfate*** = HSO_4^- (**HYDROGEN SULFATE**)

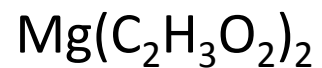
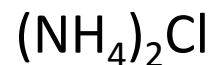
Ex) Baking soda is called sodium bicarbonate, but it can also be called sodium hydrogen carbonate.

Examples:



Try these ones...

Write the names for the following ionic compounds that contain complex ions



Formulas of Complex Ions

When placing a **SUBSCRIPT** number after the **FORMULAS** for a complex ion, the **GROUP** is first **BRACKETED**.

Examples:

Barium sulphate

Aluminum hydroxide

Iron (III) sulphate

Try these ones...

Write formulas for the following ionic compounds that contain complex ions

Copper (I) phosphate

Barium bromate

Magnesium Hydrogen Sulphate