

# Polyatomic Ions + Covalent Bonds

Names and Formulas

# Polyatomic Ions



I asked the cat sitting next to me if he had any sodium hypobromite

He said  $\text{NaBrO}$

# Polyatomic Ions

## 1. What are Polyatomic Ions?

- **Covalently bonded** atoms of more than one type.
- They all contain a **charge**.
- **Cannot** exist in **isolation**.

# Polyatomic Ions

2. What is the most common charge for polyatomic ions?
  - The majority are **negative**.
3. What charge is the least common for polyatomic ions? Provide an example.
  - There is **one** positive polyatomic ion
  - **$\text{NH}_4^+$  (ammonium)**

# Step 1

- Write down the symbols for each ion with the metal one first
- Example:

Calcium	Phosphate
Ca	PO <sub>4</sub>

## Step 2

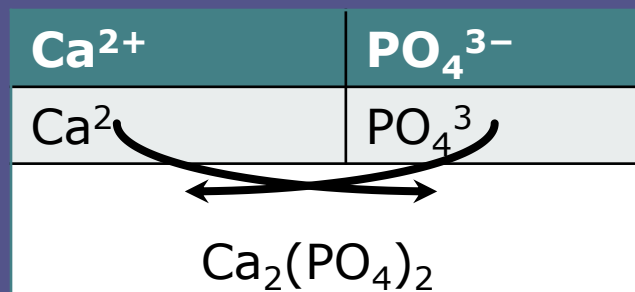
- Determine the ionic charge or combining capacity for each ion and place it to the top right of the symbol

<b>Ca</b>	<b>PO<sub>4</sub></b>
Ca <sup>2+</sup>	PO <sub>4</sub> <sup>3-</sup>



# Step 3

- Drop the signs and crisscross down



## Step 4

- Reduce if possible
- $\text{Ca}_3(\text{PO}_4)_2$
- Note: brackets are necessary when there is more than one of each polyatomic ion.
- $(\text{NH}_4)_2\text{SO}_4$
- As there is only one **sulphate** group there are not brackets in the example above



# Roman Numerals

Number	Roman Numeral
1	I
2	II
3	III
4	IV
5	V
6	VI
7	VII

# Practice

- Calcium and sulphate
- Cadmium and carbonate
- Chromium (III) and chloride
- Iron (III) and bisulphate

# Naming Chemical Compound

- Write down the names of each ion with the metal first
- $\text{Ca}_3(\text{PO}_4)_2$
- calcium phosphate

# Practice

- $\text{Ni}(\text{OH})_2$
- $\text{Pb}(\text{CO}_3)_2$
- $\text{NaHCO}_3$
- $\text{Cu}(\text{NO}_3)_2$

# Covalent Compounds



Two scientists walk into a restaurant  
Scientist one: "I want H<sub>2</sub>O"  
Scientist two: "I want H<sub>2</sub>O, too"  
The second scientist dies

# Covalent Bonds

## 1. What is a covalent bond?

- A bond where the **electrons** are **shared**.
- The **subscripts** in these compounds indicate the **actual number** of **atoms** of each element.

# Binary Covalent Compounds

2. What is a binary covalent compound?

- Comprised of **two non-metals** that **share** their **electrons**
- Can have **one** or **more covalent bonds**
- Can have **many atoms** (two or more)



# Binary Covalent Compounds

## 3. What is a prefix?

- It is a combination of letters added to the **beginning of a word**.
- The combination of letters has a specific meaning
- Example: **mono-** in monofluoride means there is **one** fluorine atom.

# Binary Covalent compounds

4. If mono- is 1 what are the other prefixes used in covalent compounds?

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

# Step 1

- Write down the symbols for each element
- Example: Carbon Dioxide

Carbon	Oxygen
C	O

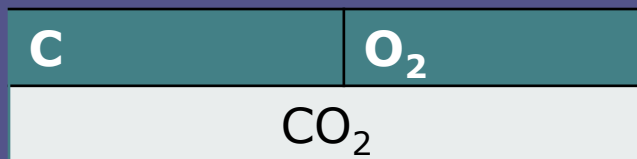
## Step 2

- Write the number of each element you have based on the prefix in the name.

c	o
C	O <sub>2</sub>

## Step 3

- Write the formula



**NEVER**

reduce a covalent compound formula

# Practice

- carbon disulphide
  - tellurium trioxide
  - boron monoxide
  - nitrogen dioxide
- 
- $P_2O_3$
  - $As_2O_5$
  - $SCl_4$
  - $ICl_3$

# Naming Chemical Compound

- Write down the names of each elements
- Phosphorous Oxygen
- Write the prefix for each element. Do not include mono- for the first element if there is only one atom.
- diphosphorus trioxygen



- Drop the ending of the second element name and **ADD IDE**
- diphosphorus trioxygen
- diphosphorus triox
- diphosphorus trioxide