

Chapter 6 : Chemical Formulae and Equations

Chemical Formulae

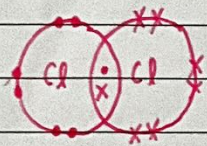
- Like a recipe showing the **ratio of elements in 1 unit of a substance**
- Made up of :
 - **Chemical symbols** that indicate which elements are present
 - **Subscripts** showing the number of atoms of each element

Monoatomic elements

- Exist as **uncombined atoms**
- Made up of **1 atom**
- Generally **unreactive** due to their **full valence shells**

Diatomic molecules

- Exist as **two chemically combined atoms**
- Example :



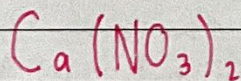
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Polyatomic Molecules

- Exist as **three or more chemically combined atoms**

Chemical Formulae of Compounds

- Made up of atoms of elements that are **chemically combined**
- Look at Calcium Nitrate:



- Subscript "**2**" notes that there are **2 nitrate ions**
- There are **6 oxygen, 2 nitrogen, 6 calcium**

How are chemical Formulae constructed?

- Valency

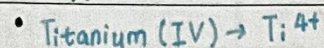
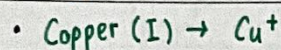
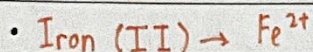
→ The valency of an element is the number of electrons that must be lost, gained or shared to be stable

→ The valency of an ion is its charge without the sign

- Valences from roman numerals

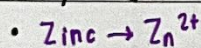
→ Transition metals can form one or more stable ions to have different valences

→ Examples:



→ Though zinc and silver are transition metal, they only form one common ion each.

→ Thus, they have fixed valences.

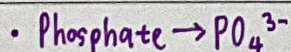
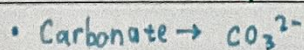
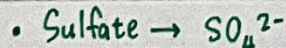
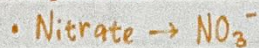
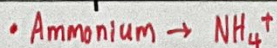


- Valences of polyatomic ions

→ Made of more than one atom covalently bonded together

→ Carry overall charges, so overall valence based on the charge on the ions.

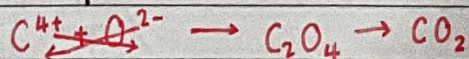
→ Examples:



- Deducing chemical formulae of compounds

- We can "cross-multiply" valences of chemical species

- Example:



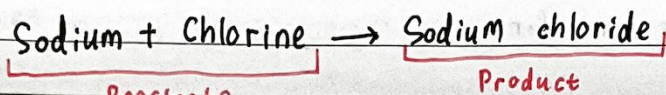
What are chemical equations and how can they be balanced?

- Word equations

→ ~~Reacto~~ Reactants at LHS

→ Products at RHS

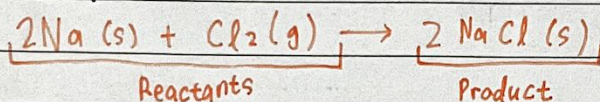
→ Example:



- Chemical equations

→ Balanced chemical equations represent the ratio and states of reactants and products.

→ Example:



→ Every element on LHS must appear on RHS

↳

- Ionic Equations

→ Shows the ions taking part in reaction

→ Usually involves at least one aqueous reactant that is an ionic compound

→ Unchanged substances do not take part in the reactions

→ These are called spectator ions

→ Aqueous covalent substances should not be split