Topic: Chemical Combinations III

Subtopics:

1. **Naming of Chemical Compounds**
2. **Conventional Naming vs IUPAC Naming**

Lesson Objectives:

By the end of this lesson, students should be able to:

- Understand how to **name chemical compounds** correctly.
- Differentiate between **conventional names** and **IUPAC names**.
- Apply **IUPAC rules** for naming simple compounds.
- Write the names and formulae of **common compounds**.

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1. Naming of Chemical Compounds

Why is Naming Important?

- To **identify and classify compounds**.
- To communicate **clearly and universally** in science.
- To understand the **composition of compounds** from their names.

Types of Chemical Compounds:

Type of Compound	**Examples**
Ionic Compounds	NaCl, MgO
Covalent Compounds	H_2O, CO_2
Acids	HCl, H_2SO_4
Bases	NaOH, $Ca(OH)_2$
Salts	Na_2SO_4, KNO_3

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2. Conventional Naming vs IUPAC Naming

a) Conventional Naming

- Names are based on **historical usage or local language**.
- Often **do not follow systematic rules**.
- Widely used in **daily life and industry**.

Examples of Conventional Names:

Compound	Conventional Name
NaCl	Common Salt
H_2O	Water
NH_3	Ammonia
$CaCO_3$	Chalk or Limestone
H_2SO_4	Oil of Vitriol
NaOH	Caustic Soda

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b) IUPAC Naming

IUPAC stands for **International Union of Pure and Applied Chemistry**.

- Provides **standardized naming rules**.
- Ensures **consistency and global understanding**.
- Names indicate the **composition of the compound**.

Basic IUPAC Rules for Naming Compounds:

Ionic Compounds (Metal + Non-Metal)

Formula: Metal + Non-Metal (add **-ide** ending)

Compound	IUPAC Name
NaCl	Sodium chloride
MgO	Magnesium oxide
$CaBr_2$	Calcium bromide
K_2S	Potassium sulphide

If the metal has multiple valencies, use **Roman numerals**:

Compound	Name
$FeCl_2$	Iron(II) chloride
$FeCl_3$	Iron(III) chloride
CuO	Copper(II) oxide
Cu_2O	Copper(I) oxide

Covalent Compounds (Non-Metal + Non-Metal)

Use **prefixes** to indicate the number of atoms:

Prefix	Number
Mono	1
Di	2
Tri	3
Tetra	4
Penta	5
Hexa	6

Examples:

Compound	IUPAC Name
CO	Carbon monoxide
CO_2	Carbon dioxide
N_2O	Dinitrogen monoxide
NO_2	Nitrogen dioxide
PCl_5	Phosphorus pentachloride
SO_3	Sulphur trioxide

Acids

Formula	Name
HCl	Hydrochloric acid
H_2SO_4	Sulphuric acid
HNO_3	Nitric acid
H_2CO_3	Carbonic acid

Bases

Formula	Name
NaOH	Sodium hydroxide
KOH	Potassium hydroxide
$Ca(OH)_2$	Calcium hydroxide
NH_4OH	Ammonium hydroxide

Salts

Derived from the reaction of **acid + base**.

Salt	Acid	Base
NaCl	HCl	NaOH
KNO_3	HNO_3	KOH
$CaSO_4$	H_2SO_4	$Ca(OH)_2$

Oxyanions (Compounds with Oxygen)

Ion	Name
NO_3^-	Nitrate
NO_2^-	Nitrite
SO_4^{2-}	Sulphate
SO_3^{2-}	Sulphite
CO_3^{2-}	Carbonate
PO_4^{3-}	Phosphate

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3. Differences Between Conventional and IUPAC Naming

Conventional Name	IUPAC Name
Water	Dihydrogen monoxide (rarely used, but correct IUPAC name)
Ammonia	Nitrogen trihydride
Baking Soda	Sodium hydrogen carbonate
Caustic Soda	Sodium hydroxide
Chalk	Calcium carbonate
Oil of Vitriol	Sulphuric acid

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4. Importance of IUPAC Naming

- Prevents **confusion across languages and regions**
- Helps in **learning chemical structure**
- Makes **chemical communication universal**

Summary of Key Points

Concept	Meaning
Conventional Naming	Names based on history or local usage
IUPAC Naming	Systematic global naming of compounds
Ionic Compounds	Metal + Non-metal (-ide ending)
Covalent Compounds	Non-metal + Non-metal (use prefixes)
Acids/Bases/Salts	Named based on reaction with water

Conclusion

Understanding **chemical naming systems** is crucial for reading, writing, and communicating in chemistry.
The **IUPAC system** helps students and scientists worldwide to describe chemicals in a **clear and standard way**.