CHEMISTRY

Fsc MLT

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What is a Chemical Compound?

- **Definition:**
  A **chemical compound** is a **substance formed when two or more elements** combine **chemically in a fixed ratio**.
- The elements are **bonded together** (either **ionic** or **covalent** bonds).
- The compound has **different properties** from the elements it is made of.
- **Example:**
  💧 Water (H_2O) → made of **Hydrogen + Oxygen**, but has different properties than both.

Chemical Composition

- **Definition:**
  Chemical composition refers to the **types and proportions of elements** that make up a compound.
- **Example:**
- Water (H_2O) → 2 atoms of Hydrogen, 1 atom of Oxygen
- Glucose ($C_6H_{12}O_6$) → 6 Carbon, 12 Hydrogen, 6 Oxygen
- **Meaning:**
  Every compound has a **fixed chemical formula** that shows its composition.

Examples of Common Compounds

Compound Name	Chemical Formula	Elements Present	Common Use
Water	H_2O	Hydrogen + Oxygen	Essential for life
Carbon dioxide	CO_2	Carbon + Oxygen	Exhaled gas, used by plants
Sodium chloride	NaCl	Sodium + Chlorine	Table salt
Glucose	$C_6H_{12}O_6$	Carbon + Hydrogen + Oxygen	Main sugar in blood
Ammonia	NH_3	Nitrogen + Hydrogen	Used in cleaning solutions

Examples of Common Compounds

- We handle and consume many chemical substances every day.
- Examples: **Table salt (NaCl), sugar, vinegar**.
- To understand them, we must know what a **chemical substance** means and its **composition**.

Role of Chemical Composition

- Two substances may have the same elements but different arrangements → different properties.
- Example: **Diamond** vs **Graphite** (both carbon).
- Diamond: Transparent, poor conductor, very hard.
- Graphite: Opaque, good conductor, soft.

Composition of the Universe

- **Chemical composition has also changed with time.**
  Charts show composition:
- **Today:**
- Dark energy: 72%
- Dark matter: 23%
- Atoms: 4.6%
- **1.37 billion years ago (Universe 380,000 years old):**
- Dark matter: 63%
- Atoms: 12%
- Protons: 15%
- Neutrons: 10%

Chemical Composition of Substances

- Any substance which has a clear and specific chemical composition and structure is known as a **chemical**.
- Chemicals exist in a range of states — they can be **solid, liquid, or gas**. They can change their state influenced by certain factors like **pressure, temperature, etc.**
- Example: Water can change into ice or steam.

Law of Constant Composition

- The chemist **Joseph Proust** paved the foundation of modern chemistry known as the **Law of Constant Composition.**
- A chemical substance has a fixed composition.
- According to Proust's inference:
- "All samples of a compound have the same composition; i.e., all samples have the same proportion, by mass, of the elements present in the compound."
- **Example:**
  Water is a chemical compound made up of two elements — hydrogen (H) and oxygen (O).

Classification of Substances

- Substances can be classified as **pure** or **impure.**
- **Pure substances:** Have fixed chemical composition (elements and compounds).
- **Impure substances:** Have variable composition (mixtures).

Classification of Compounds

- **Compounds** can be classified as:
- **Organic compounds:** Depend on presence of carbon (e.g., glucose, proteins).
- **Inorganic compounds:** Do not depend on carbon (e.g., NaCl, H_2O).
- Compounds fall under **pure substances** category.

Mixtures Overview

- **Mixtures** can be categorized into:
- **Homogeneous mixtures:** Uniform composition throughout (e.g., salt water).
- **Heterogeneous mixtures:** Non-uniform composition (e.g., sand and water).

Differences Between Compound and Mixture

Property	Compound	Mixture
Definition	Compounds are substances formed by **chemically combining** two or more elements.	Mixtures are substances formed by **physically mixing** two or more substances.

Differences Between Compound and Mixture

Property	Compound	Mixture
Types	Compounds can be of three types — **covalent**, **metallic**, and **ionic compounds.**	Mixtures are of two types — **homogeneous** and **heterogeneous.**

Differences Between Compound and Mixture

Property	Compound	Mixture
Substance Category	Falls under **pure substances.**	Falls under **impure substances.**

Nature

Property	Compound	Mixture
Nature	Compounds are **always homogeneous** in nature.	Mixtures can be **homogeneous or heterogeneous.**

Separation of Constituents

Property	Compound	Mixture
Separation of Constituents	The constituents of a compound **cannot be separated by physical methods.** Only chemical or electrochemical processes can separate them.	Constituents of a mixture **can be separated by physical methods** such as filtration, evaporation, or decantation.

Properties

Property

Properties

Compound

Properties of a compound are **entirely different** from the properties of its elements.

Mixture

Properties of a mixture are **the sum** of properties of its individual components.

New Substance Formation

Property	Compound	Mixture
New Substance	A **new substance** is formed after combining elements.	**No new substance** is formed; each substance retains its identity.

Melting & Boiling Points

Property	Compound	Mixture
Melting & Boiling Points	Fixed and well-defined.	Vary according to the proportion of components.

Examples

Property	Compound	Mixture
Examples	Water, Salt, Baking soda, etc.	Oil and water, Sand and salt, Smoke, Fog, etc.


Any
Question?


Thank You