

Class 9 Science – Chapter 2: Is Matter Around Us Pure

1. Meaning of “Pure Substance” (Scientific View)

In everyday language, pure means “no dirt” or “not mixed with anything unwanted.”

But in **chemistry**, a substance is pure when:

- It contains **only one type of particles**
- It has a **fixed composition**
- It shows **definite physical and chemical properties**

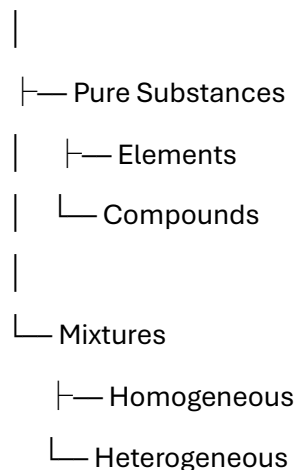
Examples of Pure Substances

- Distilled water (H_2O)
 - Oxygen gas (O_2)
 - Iron (Fe)
 - Carbon dioxide (CO_2)
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2. Classification of Matter

Matter around us is classified based on composition:

Matter



3. Pure Substances

Pure substances are of **two types**:

A. Elements

An **element** is a substance made of **only one kind of atom** and **cannot be broken down** into simpler substances by chemical reactions.

Total known elements: More than 110

Types of Elements

1. Metals

Properties:

- Lustrous (shiny)
- Hard (generally)
- Malleable (can be beaten into sheets)
- Ductile (can be drawn into wires)
- Good conductors of heat and electricity

Examples: Iron, Copper, Gold, Aluminium

2. Non-Metals

Properties:

- Usually dull
- Poor conductors
- Not malleable or ductile
- Many are gases

Examples: Oxygen, Nitrogen, Sulphur, Carbon

3. Metalloids

Elements showing properties of both metals and non-metals.

Examples: Silicon, Boron, Germanium

B. Compounds

A **compound** is a pure substance formed when **two or more elements combine chemically in a fixed ratio**.

Examples

Compound	Elements	Ratio
Water (H ₂ O)	Hydrogen + Oxygen	2:1
Carbon dioxide (CO ₂)	Carbon + Oxygen	1:2

Compound	Elements	Ratio
Sodium chloride	Sodium + Chlorine	1:1

Properties of Compounds

- Properties are **different** from elements
 - Composition is **fixed**
 - Have a **chemical formula**
 - Can be separated only by **chemical methods**
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4. Mixtures

A **mixture** is formed when two or more substances are mixed physically.

Examples

- Air
- Sugar solution
- Soil
- Milk

Characteristics

- No fixed ratio
 - Components keep their properties
 - Can be separated by physical methods
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Types of Mixtures

1. Homogeneous Mixture

A mixture with **uniform composition**.

Also called a **solution**.

Examples: Salt water, Air, Vinegar

2. Heterogeneous Mixture

Composition is **not uniform**.

Examples: Sand + water, Oil + water

5. Solution

A **solution** is a homogeneous mixture of solute and solvent.

Term	Meaning
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Solute	Substance that dissolves
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Solvent	Substance that dissolves solute
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Example: Salt (solute) + Water (solvent)

Properties of Solutions

- Particles very small ($< 1\text{ nm}$)
 - Cannot be seen
 - Do not scatter light
 - Stable
 - Cannot be separated by filtration
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6. Concentration of a Solution

Mass by Mass Percentage

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

7. Suspension

A **suspension** is a heterogeneous mixture where particles are large and visible.

Examples: Muddy water, Chalk powder in water

Properties

- Particles visible
 - Scatter light
 - Settle down on standing
 - Can be filtered
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8. Colloids

A **colloid** is between solution and suspension.

Examples: Milk, Fog, Smoke

Term	Meaning
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Dispersed phase	Particles
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Dispersion medium	Medium
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Properties

- Show Tyndall effect
- Stable
- Cannot be filtered easily

9. Tyndall Effect

Scattering of light by colloidal particles.

Example: Light beam visible in dusty room.

10. Separation of Mixtures

Method	Principle	Example
Filtration	Insoluble solid	Sand + water
Evaporation	Solid from liquid	Salt from seawater
Centrifugation	Density difference	Cream from milk
Sublimation	Solid → gas	Camphor
Chromatography	Different solubility	Ink colors
Distillation	Boiling point difference	Alcohol + water
Fractional distillation	Close boiling points	Petroleum

11. Physical vs Chemical Change

Physical Change	Chemical Change
No new substance	New substance formed
Reversible	Irreversible
Example: Ice melting	Burning paper

12. Mixture vs Compound

Mixture**Compound**

Physical combination Chemical combination

Variable composition Fixed composition

Properties remain New properties

Separated physically Need chemical reaction

Chapter in One Line

Matter is either **pure substance (element/compound)** or **mixture (solution, suspension, colloid)**, and mixtures can be separated by physical methods.
