

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

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### 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

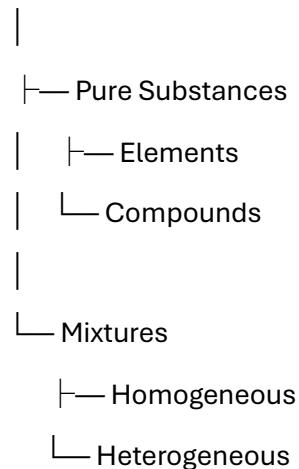
- Distilled water ( $\text{H}_2\text{O}$ )
- Oxygen gas ( $\text{O}_2$ )
- Iron (Fe)
- Carbon dioxide ( $\text{CO}_2$ )

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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**:

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#### 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

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#### **2. Non-Metals**

Properties:

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

Examples: Oxygen, Nitrogen, Sulphur, Carbon

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#### **3. Metalloids**

Elements showing properties of both metals and non-metals.

Examples: Silicon, Boron, Germanium

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### **B. Compounds**

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

#### **Examples**

<b>Compound</b>	<b>Elements</b>	<b>Ratio</b>
Water (H <sub>2</sub> O)	Hydrogen + Oxygen	2:1
Carbon dioxide (CO <sub>2</sub> )	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

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##### 2. Heterogeneous Mixture

Composition is **not uniform**.

Examples: Sand + water, Oil + water

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### 5. Solution

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

**Term      Meaning**

Solute Substance that dissolves

Solvent Substance that dissolves solute

Example: Salt (solute) + Water (solvent)

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**Properties of Solutions**

- Particles very small (< 1 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**

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

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**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

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<b>Term</b>	<b>Meaning</b>
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Dispersed phase    Particles

Dispersion medium    Medium

**Properties**

- Show Tyndall effect
- Stable
- Cannot be filtered easily

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**9. Tyndall Effect**

Scattering of light by colloidal particles.

Example: Light beam visible in dusty room.

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**10. Separation of Mixtures**

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

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**11. Physical vs Chemical Change**

**Physical Change      Chemical Change**

No new substance    New substance formed

Reversible            Irreversible

Example: Ice melting    Burning paper

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**12. Mixture vs Compound**

Mixture	Compound
Physical combination	Chemical combination
Variable composition	Fixed composition
Properties remain	New properties
Separated physically	Need chemical reaction

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### Chapter in One Line

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

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