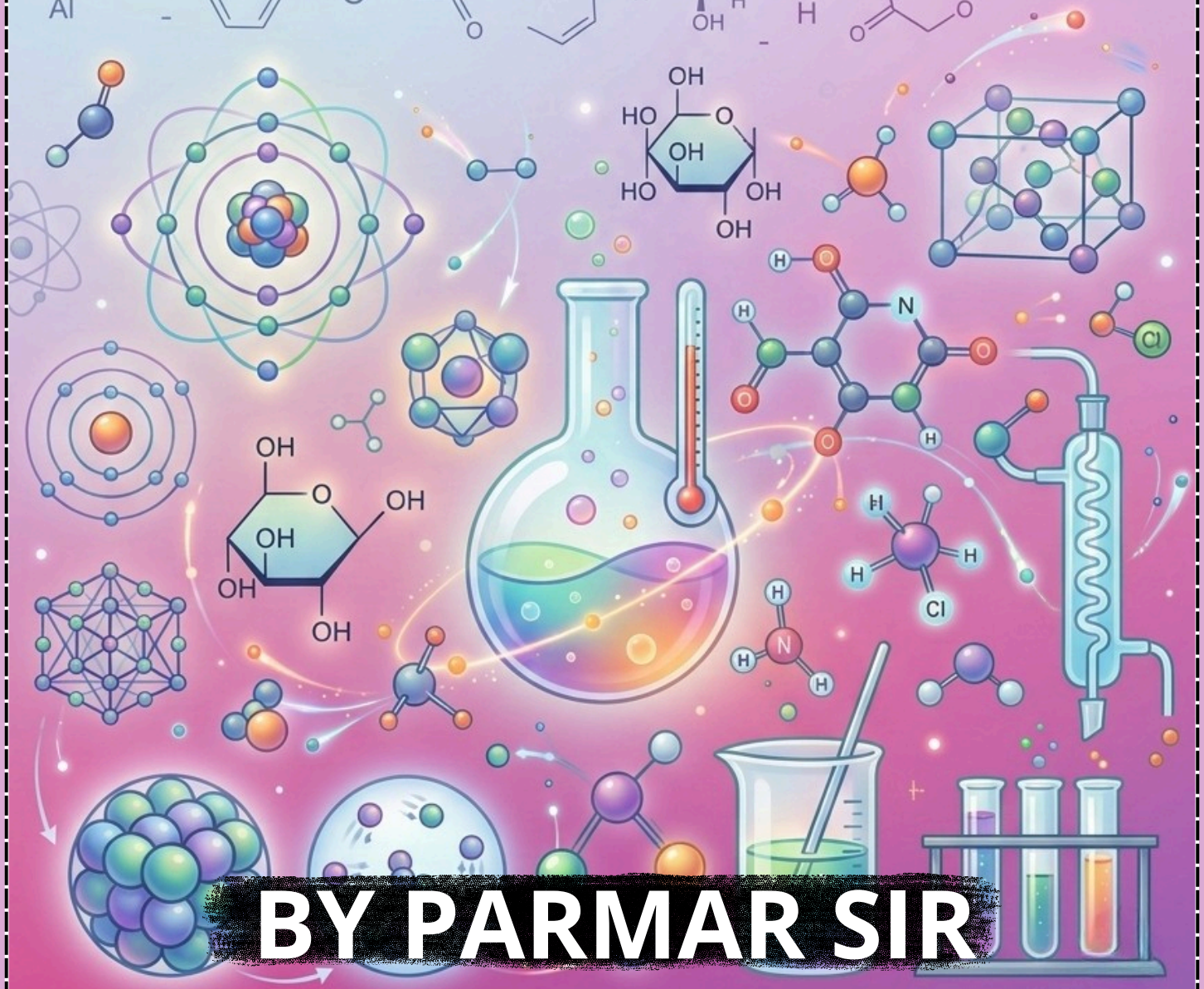
PARMAR SSC

IS MATTER PURE ?

Lecture - 2



BY PARMAR SIR

BASED ON THE COMPOSITION, MATTER CAN BE CLASSIFIED AS

PURE SUBSTANCES

- Pure substances are substances that are made up of only one kind of particle and have a fixed or constant structure.
- **E.g.** Diamond, sulphur, tin, etc.

Pure substances are of two types:

Element

- A pure substance made up of only one type of atom that cannot be broken down into simpler substances by chemical means.
- **E.g.** H (Hydrogen) and O (Oxygen)

Compound

- A pure substance made up of two or more different types of elements that are chemically bonded together in a fixed ratio.
- **E.g.** H_2O (Water).

IMPURE SUBSTANCES

- Impure substances, also known as mixtures, are made up of two or more different substances.
- **E.g.** Brass (Cu+Zn), Bronze (Cu+Sn)

Mixture

- A mixture is a composition of two or more pure substances. Mixtures are considered to be homogeneous or heterogeneous in nature.

Homogeneous Mixture	Heterogeneous Mixture
Particle size < 1nm	Particle size > 1000nm
They have a uniform composition	They have a non-uniform composition
Components cannot be separated through physical process	Components can be separated through physical process
Components cannot be seen through naked eyes	Components can easily be seen through naked eyes
Exists in single phase. E.g. water and milk	Exists in two or more phase. E.g. oil in water

Solution

- A solution is a homogeneous mixture formed when one or more substances (solute) dissolve in another substance (solvent).



Solute+ Solvent =Solution

Examples of Solutions:

Type of Solution	Solute	Solvent	Example
Solid in Liquid	Solid	Liquid	Sugar in water
Solid in Solid	Solid	Solid	Alloys (e.g., Brass, Bronze)
Liquid in Liquid	Liquid	Liquid	Water and Ink
Gas in Liquid	Gas	Liquid	Aerated drinks like soda water (Carbon dioxide in water)
Gas in Gas	Gas	Gas	Air (Oxygen and Nitrogen)
Gas in Solid	Gas	Solid	Hydrogen dissolved in palladium

Properties of Solution

- It is homogeneous in nature.
- The particles of a solution are too small (less than 1nm)
- It does not scatter light
- It cannot be separated by filtration.
- It is stable in nature.

More Examples of Solution

- A solution of iodine in alcohol is known as "**Tincture of Iodine**", this solution has iodine (solid) as the solute and alcohol (liquid) as the solvent. This solution is also used as an Antiseptic.
- Air is a mixture of gas in gas. Air is a homogeneous mixture of a number of gases. Its two main constituents are: oxygen (21%) and nitrogen (78%). The other gases are present in very small quantities.

Types of Solution

- **Unsaturated Solution:** Contains less solute than the maximum amount it can dissolve.
- **Saturated Solution:** Contains the maximum amount of solute that can dissolve at a specific temperature.
- **Concentrated Solution:** Contains a large amount of solute relative to the solvent.

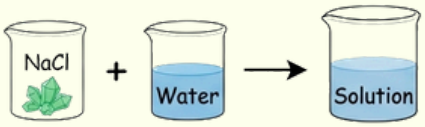
Calculation of Mass % of a Solution:

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

PROBLEM STATEMENT

We are given:

- Mass of Solute (NaCl) = **40g**
- Mass of Solvent (Water) = **320g**



NOTE: Mass of Solution = Solute Mass + Solvent Mass

CALCULATION STEPS

STEP 1: Find Total Mass of Solution
= 40g + 320g
= **360g**

STEP 2: Apply the Formula
$= \frac{40}{360} \times 100$

STEP 3: Simplify and Calculate
$= (\frac{40}{360}) \times 100$
$= (4 / 36) \times 100$
$= (1 / 9) \times 100$
$= 11.11...\%$

11.11% (approx.)

Alloy

- An alloy is a mixture of different metals or non-metals that cannot be separated by physical methods.
- **E.g.** Brass, Bronze, Nichrome, etc



Suspension

- A suspension is a mixture in which two or more substances are combined in a non-uniform manner.
- The solute does not dissolve completely and particles remain large enough to be seen with the naked eye.
- **E.g.** muddy water, flour in water, chalk powder in water.

Properties of Suspension:

- Heterogeneous in nature.
- Scatters light (Tyndall Effect); particle size > 1000 nm
- Separated by filtration.
- Unstable; solute settles down.

Colloids

- A colloid is a mixture in which one substance is dispersed evenly throughout another.
- They appear uniform but are actually heterogeneous under a microscope.
- Particle size is 1-1000nm

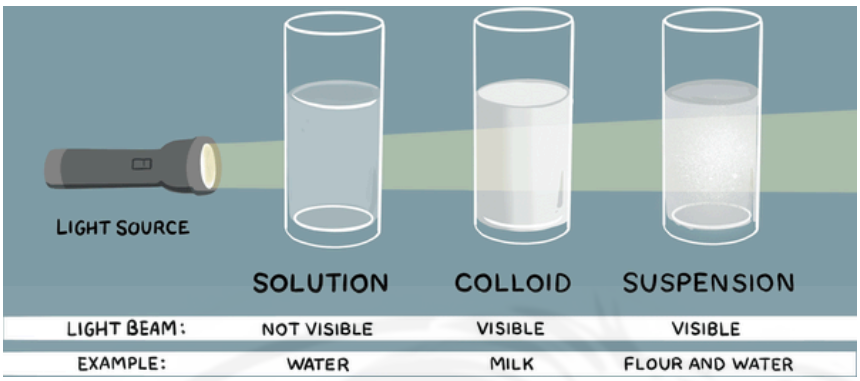


Properties of Colloids

- Heterogeneous in nature.
- Particles cannot be seen through naked eyes.
- Stable; particles do not settle down.
- Cannot be separated by filtration but can be separated by centrifugation.

Tyndall Effect

- When a beam of light is passed through a colloidal solution, the particles scatter the beam and the path of light becomes visible.
- Discovered in 1859.



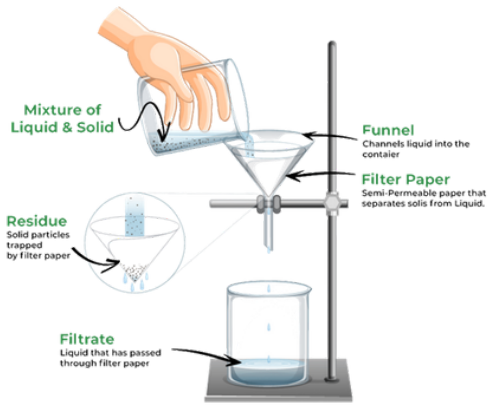
Examples of Colloids

Dispersed Phase (Solute)	Dispersion Medium (Solvent)	Type of Colloid	Examples
Solid	Solid	Solid Sol.	Coloured gemstone, milky glass
Liquid	Solid	Gel	Jelly, cheese, butter
Gas	Solid	Foam	Foam, rubber, sponge
Solid	Liquid	Sol.	Milk of magnesia, mud
Liquid	Liquid	Emulsion	Milk, face cream
Gas	Liquid	Foam	Shaving cream
Solid	Gas	Aerosol	Smoke, automobile exhaust
Liquid	Gas	Aerosol	Fog, clouds, mist

Separation Methods

Filtration

- Separates solid matter from a fluid using a filter medium.

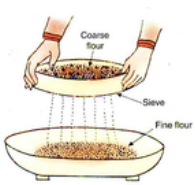


Hand-picking



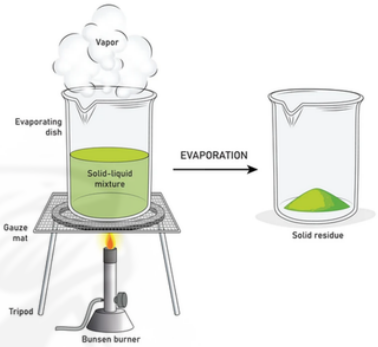
- Separating substances by hand when components are clearly visible.

Sieving



- Using a sieve to distinguish small particles from bigger particles.

Evaporation

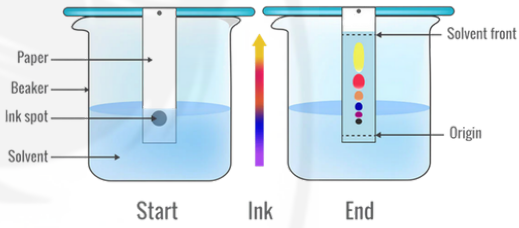


- Separates a mixture of non-volatile and volatile substances.

Application of Evaporation:

- Separate coloured dye from the ink.
- Separate salt from water.
- Separate sugar from water.

Chromatography



- Separates components soluble in the same solvent.

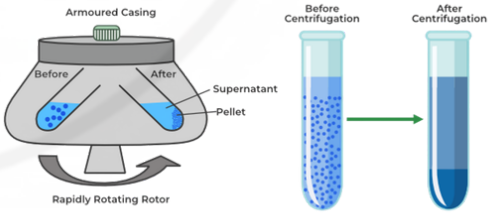
Application of Chromatography:

- It is used for separating different colors of a dye.
- It is used to separate drugs from blood.

Centrifugation

- It is a process that is used to separate denser particles from lighter particles.

Applications of Centrifugation:



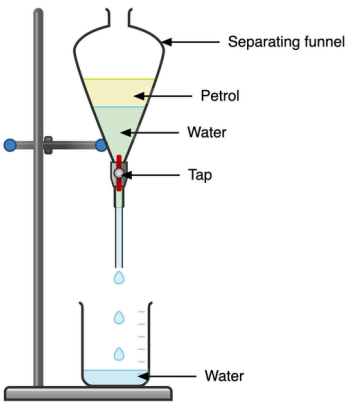
- It is used to separate cream from milk.
- It is used to separate butter from cream.
- It is used to squeeze out water from wet clothes.

Separating Funnel

- It is a process that is used to separate two immiscible liquids.

Application of Separating Funnel:

- It is used to separate oil from water.



Distillation

- It is used to separate two miscible liquids (The boiling point of the liquids must be sufficiently different).

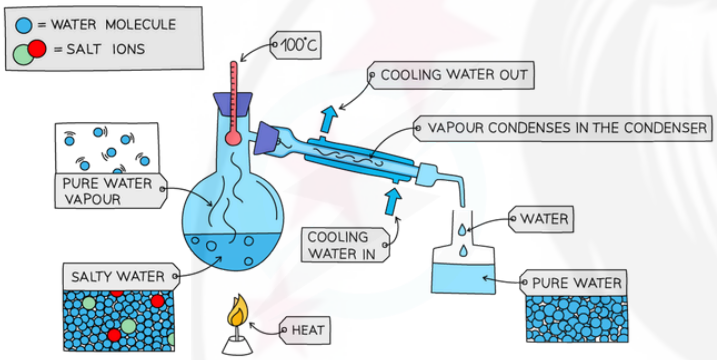
1. Simple Distillation:

- It is used to separate miscible liquids with boiling point differences of more than 25 Kelvin (or 25°C).
- **E.g,** Acetone & Water

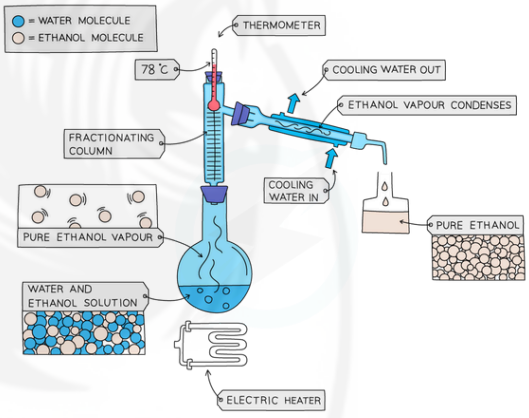
2. Fractional Distillation:

- It is used to separate miscible liquids with boiling point differences of less than 25 Kelvin (or 25°C). It is also used to separate components of air, like nitrogen and oxygen, based on their boiling points.

Simple Distillation

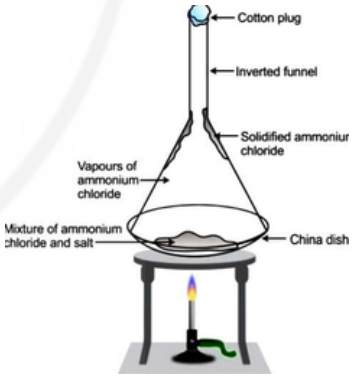


Fractional Distillation



Sublimation

- It is a process that is used to separate a sublimable component from a non-sublimable component.
- It is used to separate ammonium chloride/camphor/ naphthalene and salt.



Crystallisation

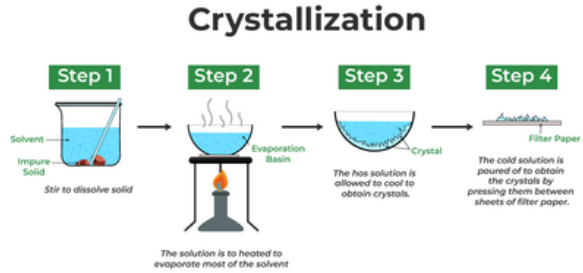
- It is a process of formation of solid crystals from a solution, melt, or by deposition directly from gas phase.
- It is the most commonly used method for the process of purification of solids.
- In this method, impure substances are dissolved in a minimum amount of water and then filtered.

Fractional Crystallization

- It is the method of separating a mixture of soluble solids by dissolving them in a suitable hot solvent and then lowering the temperature slowly.

Application of Crystallization:

- It is used to separate salt from seawater.
- It is used for purification of copper sulphate.



Physical And Chemical Changes

Physical Property

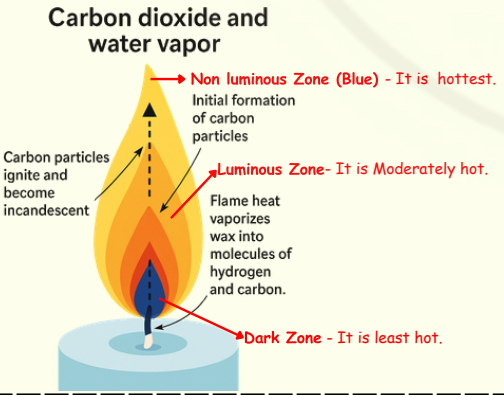
- The physical properties of a substance are those which we can observe, such as rigidity, colour, fluidity, boiling point, melting point, density, and hardness.

Chemical Property

- The chemical properties of a substance define its chemical nature, such as its odor or its chemical composition.



Physical Change	Chemical Change
No change in chemical composition	Change of chemical composition
Usually reversible	Usually irreversible
New products are not formed	New products are formed
Changes occur when heating/cooling	Always involve absorption/release of energy
No effect on chemical bonds	Direct effect on chemical bonds

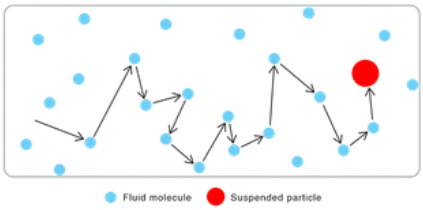


Burning of Candle

- **Wax:** Undergoes physical change as it can be used to make a new candle again.
- **Thread:** Undergoes chemical change as it cannot be obtained again once burnt.

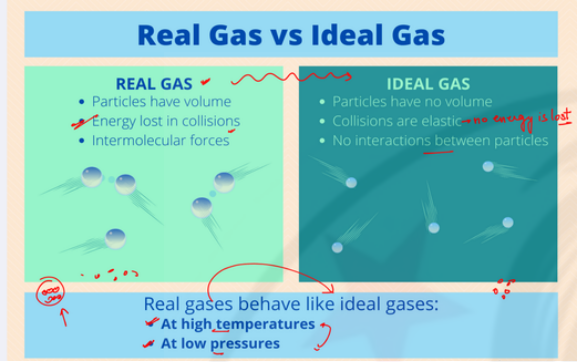
Brownian Movement

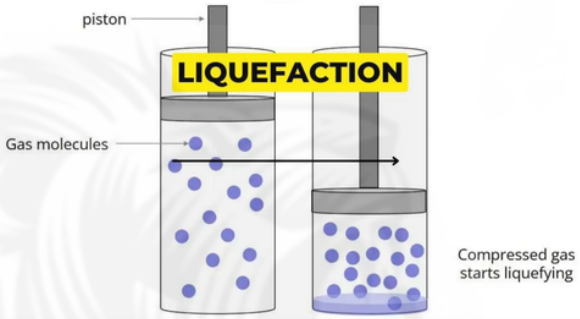
- The random, erratic movement of microscopic particles suspended in a fluid (liquid or gas), caused by constant bombardment from surrounding molecules.
- Discovered by Robert Brown in 1827.



Gas Laws

Ideal Gas	Real Gas
The intermolecular force of attraction is zero	There is some intermolecular force of attraction
It follows ideal gas equation → PV = nRT (P: Pressure; V: Volume; n: No. of moles; R = Universal gas constant; T = Temperature)	





1. Boyle's Law (1662)

- Pressure and volume are inversely proportional at constant temperature.

$$P \propto \frac{1}{V} \quad P_1V_1 = P_2V_2$$

2. Charles' Law (1787)

- Temperature and volume are directly proportional at constant pressure.

$$V \propto T \quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

3. Gay-Lussac's Law (1808)

- Pressure and temperature are directly proportional at constant volume.

$$P \propto T \quad \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

4. Avogadro's Law (1811)

- Equal volumes of all gases under same T (Temperature) and P (Pressure) contain an equal number of molecules.

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

Solubility of gases in liquids increases with decrease in temperature.



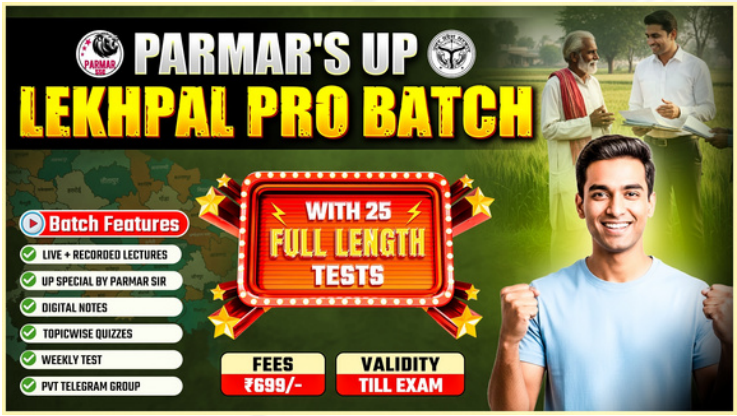


Join Now – Start Your Smart Preparation Today!

CLICK HERE

Join Now – Start Your Smart Preparation Today!

CLICK HERE





Join Now – Start Your Smart Preparation Today!

CLICK HERE

Join Now – Start Your Smart Preparation Today!

CLICK HERE





Join Now – Start Your Smart Preparation Today!

CLICK HERE