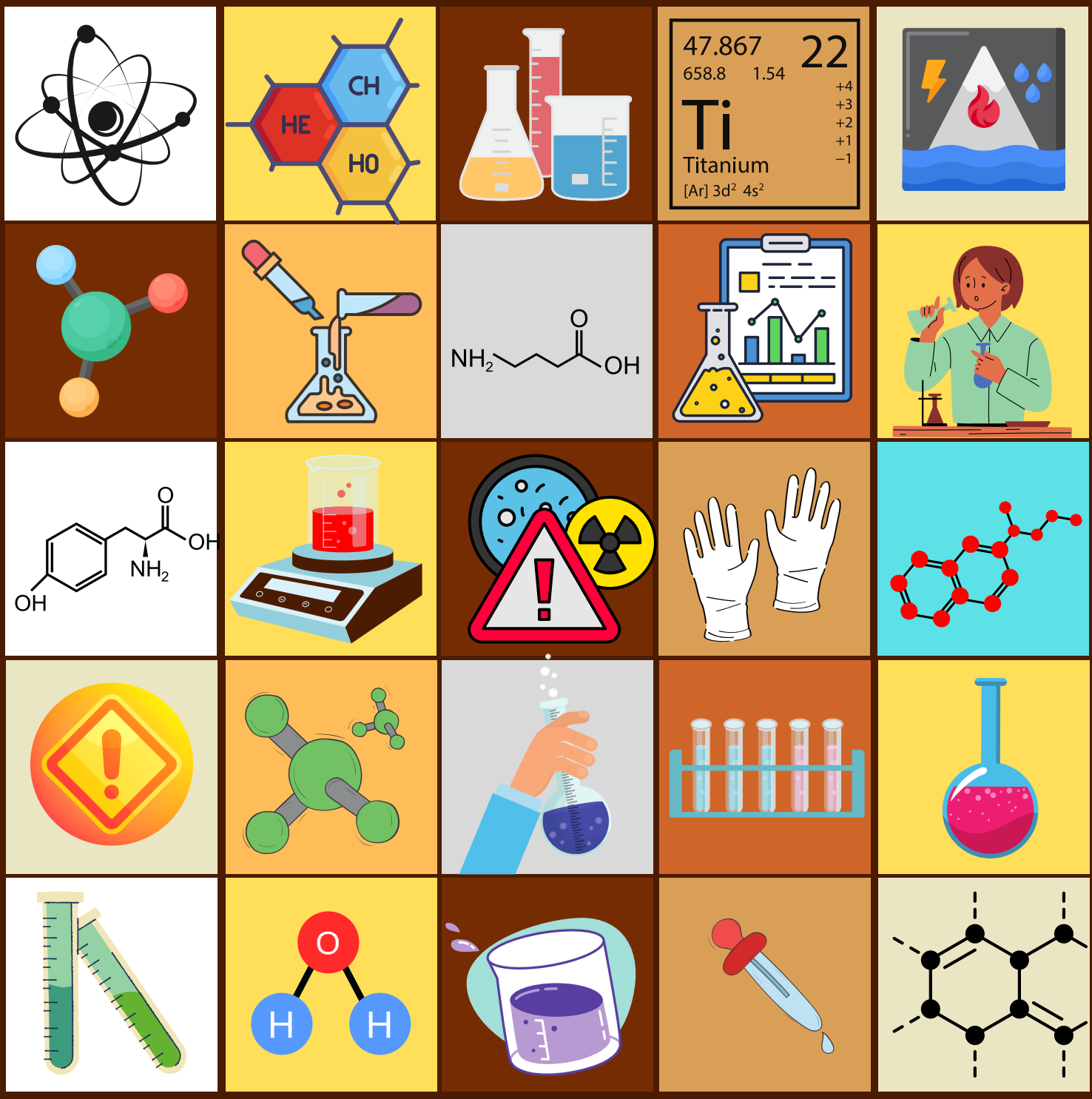


CLASS 9th NOTES

CHEMSITRY

IS MATTER AROUND US PURE?

PRASHANT KIRAD

IS MATTER AROUND US PURE?

Matter

Pure Substances ⟷ Impure Substances

Substance :

A substance is a kind of matter that cannot be separated into other kind of matter by any physical process.

Pure Substance :

A pure substance is a form of matter that has a definite composition and distinct properties. They are made of only one entity.

e.g. Milk, water, diamond, etc.

Mixture :

Mixtures are combinations of different substances, either elements or compounds, which retain their individual properties.

e.g. Crude Oil, Seawater, etc.

Types of mixtures :-

Homogeneous mixture : A mixture which has a uniform composition throughout is called a homogeneous mixture or solution.

Examples: sugar in water, salt in water.

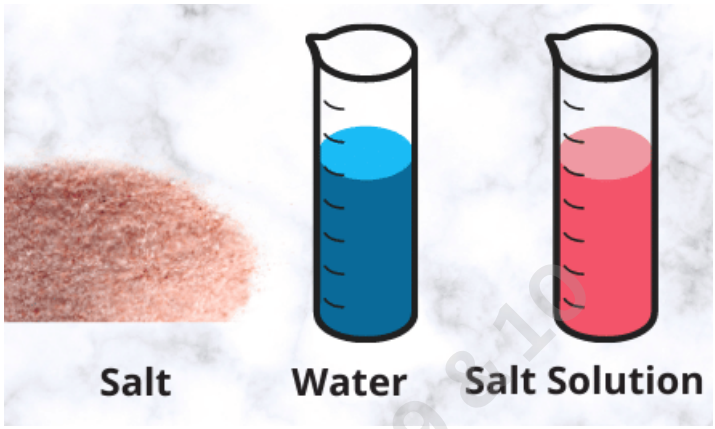
Heterogeneous mixture : A mixture which contains physically distinct parts and has a non-uniform composition is called a heterogeneous mixture.

Examples: Mixture of salt and iron filings, sand and sugar.

Solution : A solution is a homogeneous mixture of two or more substances. e.g. Soda water, Lemonade, etc.

Components of a Solution:

- **Solute:** The substance that is dissolved in the solvent. It is present in a lesser amount.
- **Solvent:** The substance in which the solute is dissolved. It is present in a greater amount.



Concentration of Solution :

Mass by mass percentage $= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$

Mass by volume percentage $= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$

Volume by volume percentage of a solution $= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$

	SOLIDS	LIQUIDS	GASES
1	Size of solute particles is smallest. < 10^{-9}m	Size of solute particles bigger than true but smaller than suspension. In between 10^{-9} to 10^{-6}m.	Size of particles biggest. > 10^{-6}m
2	Solute particles can't be seen with naked eye.	Solute particles can't be seen with naked eye.	Can be seen with naked eye.
3	Homogeneous mixture.	Seems homogeneous but actually heterogeneous.	Heterogeneous mixture.
4	Particles can't be separated by filtration .	Particles can't be separated by filtration .	Can be separated by filtration.
5	Transparent	Translucent	Opaque
6	Stable solutions - i.e. solute particles do not settle on keeping.	Stable solutions	Unstable solution-solute particles settle upon keeping.
7	Do not show tyndall effect.	Show tyndall effect.	May or may not show tyndall effect.
8	Solutions diffuse rapidly through filter paper as well as parchment paper.	Colloid particles pass through filter paper but not through parchment paper.	Suspension particles do not pass through filter paper as well as parchhment paper.
9	e.g. Sugar in water.	e.g. Milk, blood.	e.g. Sand/mud in water.

Common examples of colloids :

Dispersed Phase : The solute-like component of the dispersed particles in a colloid form the dispersed phase.

Dispersion Medium : The component in which the dispersed phase is suspended is known as the dispersing medium.

Aerosol : A colloidal solution with dispersed phase solid/liquid and dispersing medium gas is called Aerosol. e.g. clouds.

Foam : A colloidal solution with dispersed phase gas and dispersing medium solid/liquid is called Foam. e.g.Shaving cream.

Methods of Separation of Mixtures :

Evaporation :

The process of conversion of water into water vapour is known as evaporation.
Examples: Clothes drying in the sun, Tea and other hot liquids are cooled down, Dry Floors, Ice cubes melting.

- It can be used to separate the volatile component (solvent) from its non-volatile solute.

Centrifugation :

- **Centrifugation** uses centrifugal force for the separation of two liquids in a mixture.
- Here, a denser component of the mixture migrates away from the axis, and a lighter component migrates towards the axis.

Applications

- Used for blood and urine tests in diagnostic facilities.
- Used to separate butter from cream in dairies and at home.
- Utilised washing machines to extract water from drenched clothing.

By Separating Funnel :

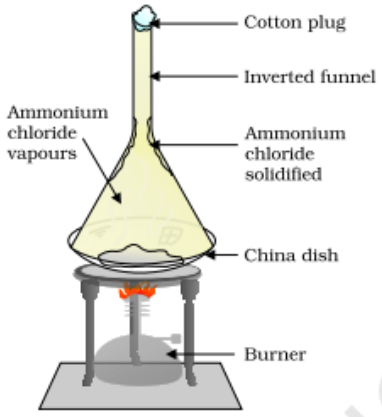
- Two immiscible liquids (which do not dissolve in each other) can be easily separated by putting in a separating funnel.
- Example : Water from oil can be separated by first opening the stop cock till water is removed in one beaker, then afterwards oil can be collected in a separate beaker.

Applications:

- Separation of oil from water
- Extraction of iron from its ore. Lighter slag is molten iron.

Sublimation :

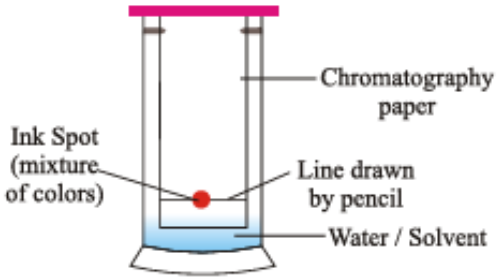
- Sublimation is the transition of a substance from solid phase to gaseous phase without changing into liquid phase.
- Example: Naphthalene balls undergo sublimation.



Sublimation of Ammonium Chloride

Chromotography :

- Chromatography is used to separate the different components in a liquid mixture.
- Coloured components of a mixture can be separated by using an Adsorbent on which they are absorbed at different rates.
- It is based on the different properties of compounds in two phases: stationary and mobile phase.

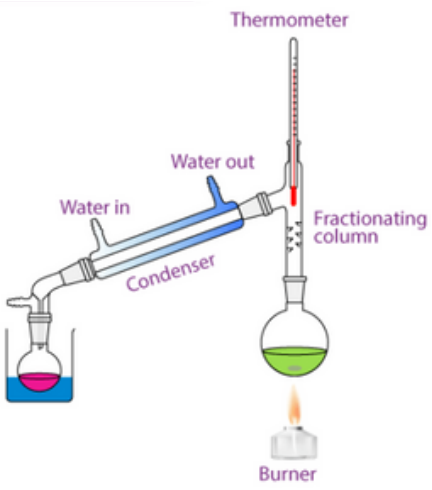


Applications :

- The technique of chromatography is extensively employed in the pharmaceutical industry in order to analyze and identify the presence of any trace amounts of chemicals and elements in a given sample.
- In the food industry, the technique of chromatography plays a vital role in the determination of the shelf life of food substances by helping in the analysis of the point at which food spoils.
- In the field of molecular biology, the study of proteomics and metabolomics often involves the use of various hyphenated chromatographic techniques.

Distillation :

- Distillation is a method for separating the component substances from a liquid mixture by selective evaporation and condensation.
- Used in: Production of gasoline, distilled water, xylene, alcohol, paraffin, kerosene etc.



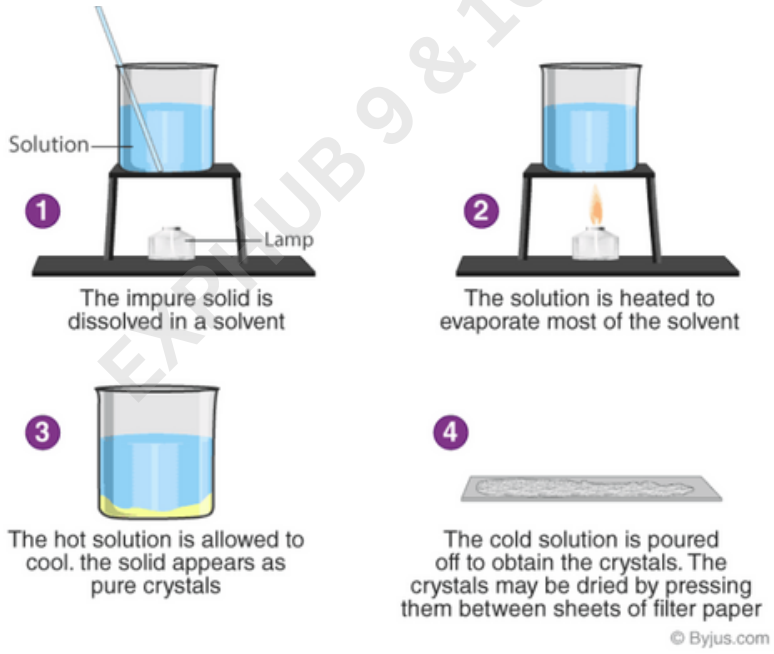
Fraction distillation :

It is the separation of a mixture into its component parts or fractions by their melting points.

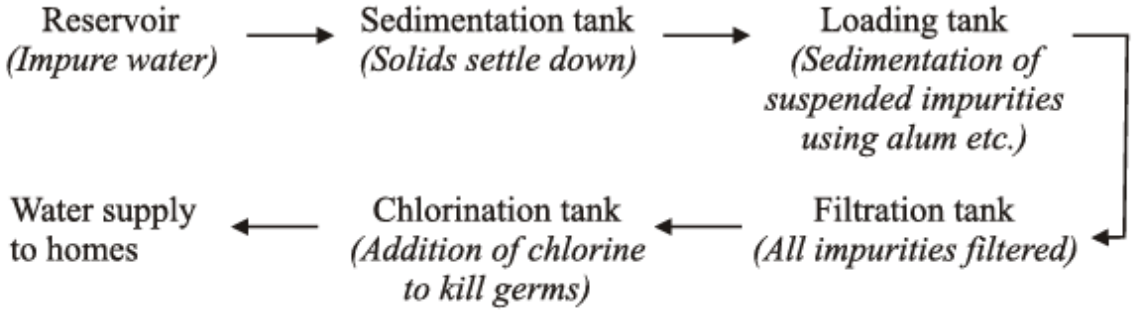
This is the process of separation of chemical compounds by their boiling point The mixture is heated to a temperature at which one or more fractions will vapourize.

Crystallisation :

- To remove impurities from a mixture by first dissolving in a suitable solvent and then crystallising out one component.
- Crystallisation is better than evaporation because during Evaporation. Some solids decompose or some, like sugar, may get charred on heating to dryness. Some impurities may remain dissolved in the solution even after filtration which on evaporation contaminates the solid.



Water purification in water treatment plants



Physical Vs Chemical change

Physical change	Chemical change
1. In a physical change, only physical properties such as colour, physical state, density, volume, etc. change; chemical properties remain unchanged.	1. In a chemical change, the chemical composition and chemical properties undergo a change.
2. No new substance is formed in a physical change.	2. A new substance is formed in a chemical change.
3. Very little or no energy in the form of heat, light or sound is usually absorbed or given out in a physical change.	3. A chemical change is always accompanied by absorption or evolution of energy.
4. A physical change is a temporary change.	4. A chemical change is a permanent change.
5. The original form of substance can be regained by simple physical methods.	5. Original substance cannot be obtained by simple physical methods.
6. A physical change is reversible.	6. A chemical change is irreversible.

Difference between Mixture and Compound:

Compounds	Mixtures
1. Components are in fixed positions;	- Components are in any positions;
2. Components can only be separated by chemical means; which require large amounts of energy;	- Components ca be separated by physical means;
3. The properties are different from those of the constituent substances;	- The properties are the average of the properties of the constituent elements;
4. Are formed by chemical means // methods; i.e. a new substance is formed and there is evolution of heat;	- Are formed by physical mans; no new substance is formed and there is no // negligible heat change;
5. Formation involves heat changes; either liberation or absorption;	- No heat change in the formation of a mixture;