Brain Builders Coaching Centre Lucknow
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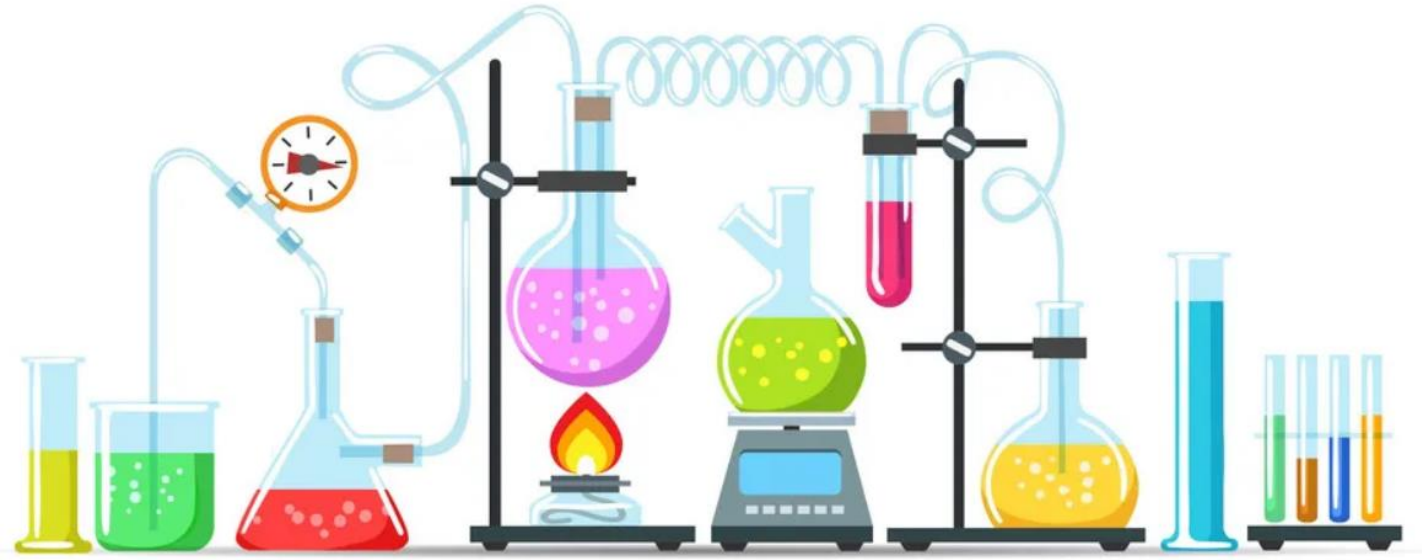
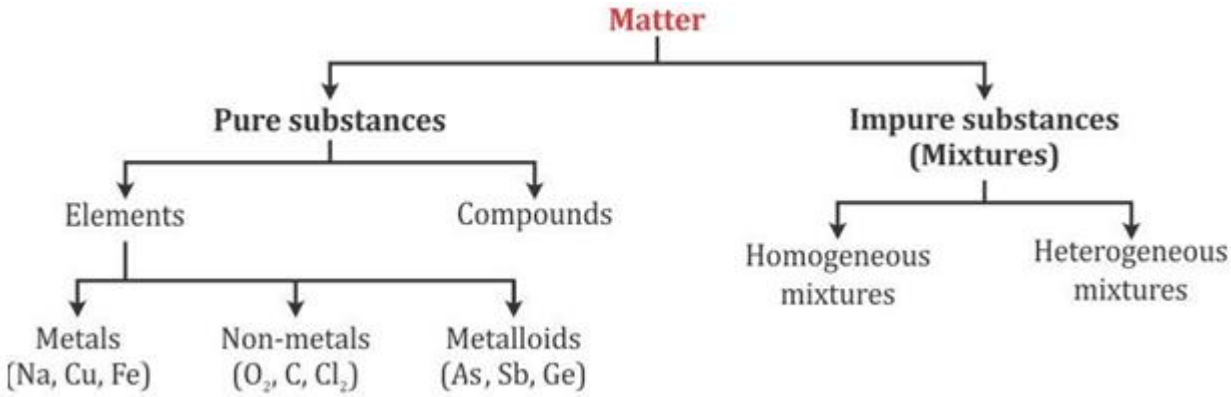
CHEMISTRY

Chapter 2: Is Matter Around Us Pure



Is Matter Around Us Pure



Pure Substance

- A pure substance is a homogeneous material with definite, invariable chemical composition and physical and chemical properties.
- A pure substance consists of only one type of atoms or molecules.
- On the basis of their chemical composition, pure substances are classified into elements and compounds.

Impure Substance

- Impure substances are mixtures of two or more elements, compounds or both, and they generally have different compositions and properties in their different parts.

What is a Mixture?

- A mixture contains more than one substance mixed in any random proportion. For example: milk, soil, lemon juice etc.
- Mixtures are constituted by more than one kind of pure form of matter known as a substance.
- A substance cannot be separated into other kinds of matter by any physical process.

  Example: Dissolved sodium chloride can be separated from water by the physical process of evaporation. However sodium chloride itself is a substance and cannot be separated by physical processes into its chemical constituents.

Properties of a Mixture

- In a mixture, two or more elements or compounds are not chemically combined together.
- The constituents of a mixture retain their original properties.
- The constituents of a mixture can be separated by using a physical process such as hand picking, filtration, holding a magnet etc.

Types of Mixtures

Homogeneous mixture

A mixture which has uniform composition and properties throughout its mass is called a homogeneous mixture.

Example: All **solutions** such as sugar solution, salt solution etc.

Heterogeneous mixture

A mixture which has a different composition and properties in different parts of their mass is called a heterogeneous mixture.

Example: Suspension (sand mixed with salt, sugar in oil) and colloids (milk in water).

Solution

- A homogeneous mixture of two or more substances which are chemically non-reacting, whose composition can be varied within certain limits, is called a solution.

Solution = Solute + Solvent

- Solute: A substance which gets dissolved in a solvent is called a solute.
- Solvent: A substance in which a solute gets dissolved is called a solvent.

Concentration of a Solution

- The properties of a solution depend upon the nature of the solute and the solvent, and also on the proportion of the dissolved solute.
- A solution which has a high quantity of solute is said to be a concentrated solution, and a solution which has comparatively lesser quantity of solute is said to be a dilute solution.
- The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solution or the amount of solute dissolved in a given mass or volume of solvent.

$$\text{Concentration of Solution} = \frac{\text{Amount of Solute}}{\text{Amount of Solution}}$$

Or

$$\text{Concentration of Solution} = \frac{\text{Amount of Solute}}{\text{Amount of Solvent}}$$

Methods of Expressing the Concentration of a Solution

$$\text{Mass by Mass percentage of a Solution} = \frac{\text{Mass of Solute}}{\text{Mass of Solution}} \times 100$$

$$\text{Mass by Volume percentage of a Solution} = \frac{\text{Mass of Solute}}{\text{Volume of Solution}} \times 100$$

Saturated Solution

A solution, in which more solute cannot be dissolved at that temperature, is called a saturated solution.

Unsaturated Solution

A solution, in which more quantity of solute can be dissolved without raising its temperature, is called an unsaturated solution.

Solubility

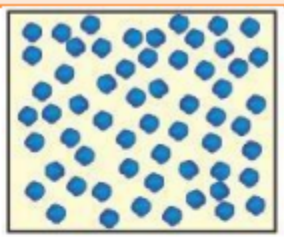
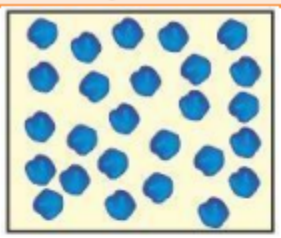
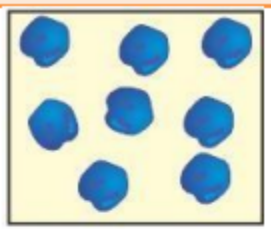
The maximum amount of a solute which can be dissolved in 100 grams of a solvent at a specified temperature is known as the solubility of that solute in that solvent at that temperature.

Effect of Temperature and Pressure on Solubility

The effect of temperature and pressure on the solubility of a substance is as follows:

- The solubility of solids in liquids usually increases on increasing the temperature and decreases on decreasing the temperature.
- The solubility of solids in liquids remains unaffected by changes in pressure.
- The solubility of gases in liquids usually decreases on increasing the temperature and increases on decreasing the temperature.
- The solubility of gases in liquids increases on increasing the pressure and decreases on decreasing the pressure.

Distinguishing Properties of Solution, Suspension and Colloidal Solution

<table>
<tr><th colspan="3">Properties</th></tr>
<tr><th>Solution</th><th>Suspension</th><th>Colloids</th></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>A solution is a homogeneous mixture.</td><td>A suspension is a heterogeneous mixture.</td><td>A colloid is a homogeneous looking heterogeneous mixture.</td></tr>
<tr><td>The dispersion medium is generally liquid.</td><td>Solids are dispersed in any medium such as liquid or gas.</td><td>Particles are dispersed in a continuous medium.</td></tr>
<tr><td>Size of the particle is about 10^{-10} m.</td><td>Very fine particles, about 10^{-7} m.</td><td>Particles having a size between 10^{-10} m and 10^{-7} m.</td></tr>
<tr><td>Due to very small particle size, they do not scatter a beam of light passing through a solution. So, the path of light is not visible in a solution.</td><td>The particles of a suspension scatter a beam of light passing through it and make its path visible.</td><td>Colloids are big enough to scatter a beam of light passing through it and make its path visible.</td></tr>
<tr><td>Dispersed substance:
Can pass through a filter paper and a semi-permeable membrane.
It is not visible to the naked eye.
They do not settle down.
Example:<table><tr><th>Solution</th><th>Solute</th><th>Solvent</th></tr><tr><td>Salt solution</td><td>NaCl</td><td>Water</td></tr><tr><td>Sugar solution</td><td>Sugar</td><td>Water</td></tr><tr><td>Copper sulphate solution</td><td>$CuSO_4$</td><td>Water</td></tr></table></td><td>Dispersed substance:
Cannot pass through a filter paper or through a semi-permeable membrane.
It is visible to the naked eye.
They settle down after sometime.
Example:<table><tr><th>Solution</th><th>Solute</th><th>Solvent</th></tr><tr><td>Chalk in water</td><td>Chalk</td><td>Water</td></tr><tr><td>Sand in water</td><td>Sand</td><td>Water</td></tr><tr><td>Coagulated matter</td><td>Coagulated matter</td><td>Water</td></tr></table></td><td>Dispersed substance:
Can pass through a filter paper but not through a semi-permeable membrane.
It is not visible to the naked eye.
They do not settle down.
Example:<table><tr><th></th><th>Dispersed phase</th><th>Dispersion medium</th></tr><tr><td>Emulsion</td><td>Liquid</td><td>Liquid</td></tr><tr><td>Sol</td><td>Solid</td><td>Liquid</td></tr><tr><td>Aerosol</td><td>Liquid</td><td>Gas</td></tr></table></td></tr>
</table>

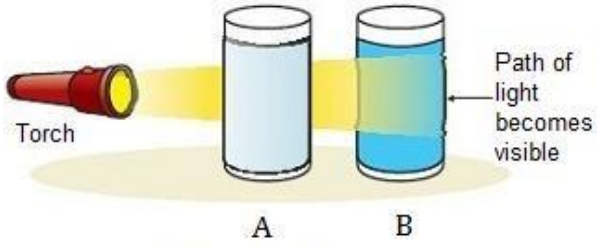
Dispersion System in Colloids

- A system consisting of a substance distributed as very small particles of a solid, droplets of liquids or tiny bubbles of a gas in a suitable medium is called as dispersion system.

- The distributed substance in the solution is called as dispersed phase.
- The medium in which the distributed substance is dispersed is referred to as the dispersion medium.

Tyndall Effect

- Tyndall effect can be defined as the scattering of a beam of light by colloidal particles present in a colloidal solution.

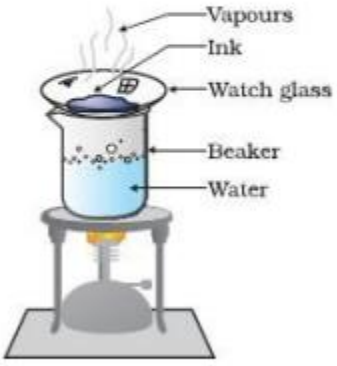


Tyndall Effect

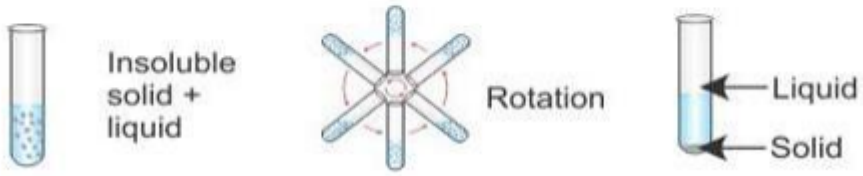
- This effect can be observed when a fine beam of light passes through a small hole in a dark room. This effect occurs due to the scattering of light by particles of dust or smoke present in the air.
- The Tyndall effect can also be observed when sunlight passes through the canopy of a dense forest. In the forest, the mist contains tiny droplets of water which act as colloidal particles dispersed in the air.

Separating the Components of a Mixture

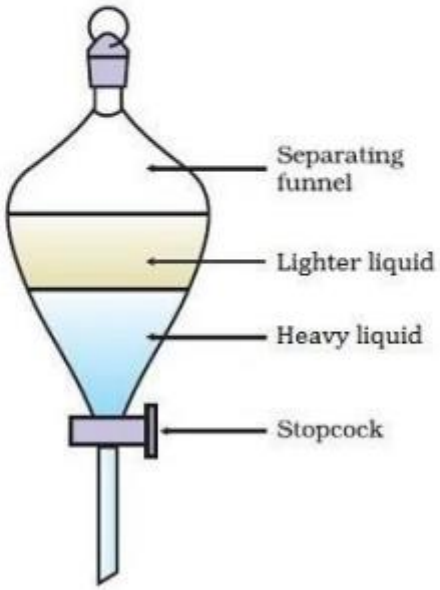
- **To obtain the coloured component of a dye from blue/black ink**

Evaporation
PRINCIPLE: This method is based on the evaporation of the liquid component in a soluble solid-liquid mixture.
TECHNIQUE: The mixture is heated such that the liquid component evaporates and the solid remains behind.
DIAGRAM: 
OBSERVATION: Ink is a mixture of a dye in water. Thus, we can separate the volatile component (solvent) from its non-volatile solute by the method of evaporation.

- **Separation of Cream from Milk**

Centrifugation
PRINCIPLE: This method is based on the principle of settling down under mechanical rotation, where insoluble heavier solid particles are present in an insoluble solid-liquid mixture.
TECHNIQUE: The mixture is placed in a test-tube and kept in a centrifugation machine. On centrifugation, the solid particles settle down under the influence of an outward centrifugal force and the liquid component of the mixture floats above it.
DIAGRAM: 
EXAMPLE- Separation of cream from milk.

- **To separate a mixture of two Immiscible liquids**

Separating funnel
PRINCIPLE: This method is based on the separation of a mixture containing two immiscible liquids, containing a heavy and a light liquid.
TECHNIQUE: The liquid-liquid mixture is added to the separating funnel and the funnel is allowed to stand for some time without any disturbance. The heavier immiscible liquid settles down and the lighter liquid floats above it. The two liquids can be removed separately with the help of the tap provided at the bottom of the funnel.
DIAGRAM: 
EXAMPLE: Separation of kerosene and water. Separation of oil and water

- **To separate a mixture of Salt and Ammonium chloride**

Sublimation
PRINCIPLE: This method is based on the sublimable and non-sublimable nature of solids.
TECHNIQUE: The mixture of a sublimable and non-sublimable substance is heated in an evaporating dish covered with an inverted funnel. This results in the evaporation of the sublimable solid and further condensation on the side of the funnel, leaving the non-sublimable solid behind in the dish.
DIAGRAM: 
EXAMPLE: Separation of ammonium chloride and sodium chloride in the laboratory. Separation of iodine and sodium chloride in the laboratory.

- **Separation of Components of Dye**

Paper Chromatography
PRINCIPLE: This method is based on the solubility of different components in solvent. The ink which we use has water as the solvent with the dye dissolved in it. As water rises on the filter paper it carries along with it the dye particles. The colour component which is more soluble in water rises faster and in this way the colours get separated.

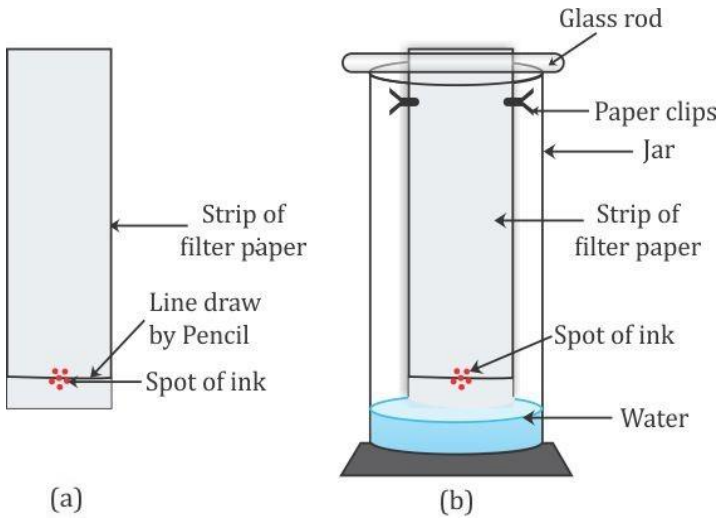
TECHNIQUE:-

- Place a spot of ink with the help of a capillary tube in the centre of a base line, about 2-3 cm away from the lower edge of a paper.
- Allow the spot to dry and hang it in a glass jar with its lower end immersed in the solvent.

Separation of Compounds

- The solvent runs over the spot and carries the components to a distance along the paper, indicated by the colored spots.

DIAGRAM:



EXAMPLE: Different component dyes in ink. Pigments from natural colours. Drug from blood.

- **To separate a mixture of two miscible liquids**

Distillation

PRINCIPLE: This method is used for the separation of components of a mixture containing

two miscible liquids which boil without decomposition and have a sufficient difference in their boiling points.

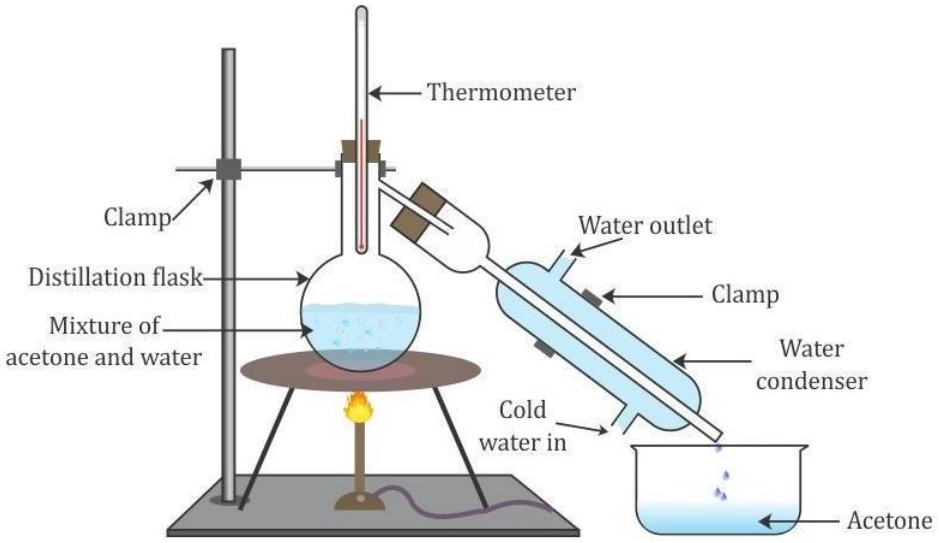
TECHNIQUE: Take the mixture in a distillation flask and fit in the thermometer. Arrange the apparatus as shown in the given figure.

Heat the mixture slowly, keeping a close watch on the thermometer.

The liquid with a low boiling point will vaporise and condense in the condenser and can be collected from the condenser outlet.

The liquid with a higher boiling point will be left behind in the distillation flask.

DIAGRAM:



EXAMPLE: Separation of a mixture of acetone and water.

- **To separate a mixture of two miscible liquids having the temperature difference less than 25°C.**

Fractional Distillation

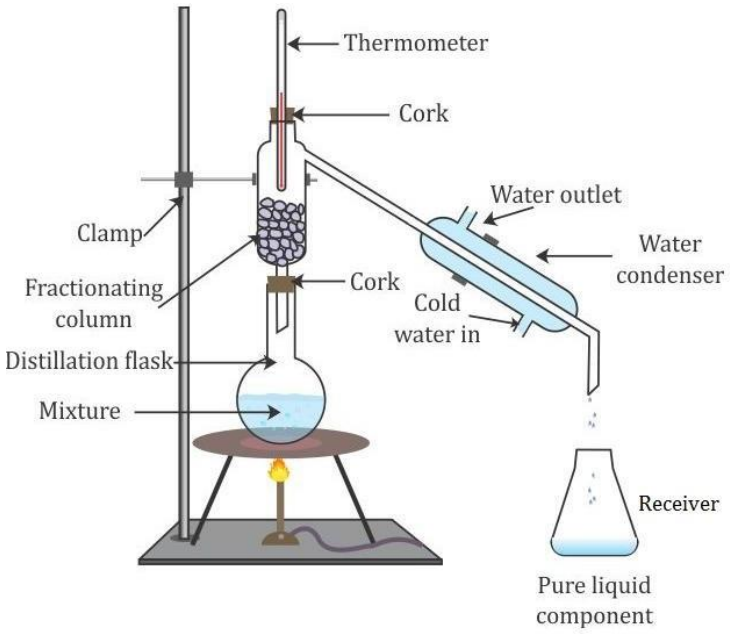
PRINCIPLE: This method is used for the separation of a mixture containing two miscible

liquids, for which the difference in their boiling points is less than 25°C.

TECHNIQUE: The mixture is kept in a distillation flask attached with a fractionating column, having glass beads. The flask is then carefully heated.

The mixture first evaporates and later condenses. The glass beads present in the fractional column provide a larger surface area for the vapours to cool down.

This technique is used to separate mixtures made up of two miscible liquids with a difference in their boiling points less than 25°C.

Separation of Compounds
The liquid with a higher boiling point remains in the distillation flask after condensation. The liquid with a lower boiling point collects in the receiver after condensation.
DIAGRAM: 
EXAMPLE: Separation of a mixture of benzene and toluene. Separation of a mixture of water and carbon tetrachloride. Crude oil can be separated into its fractions by fractional distillation.

- **To obtain different gases from air**

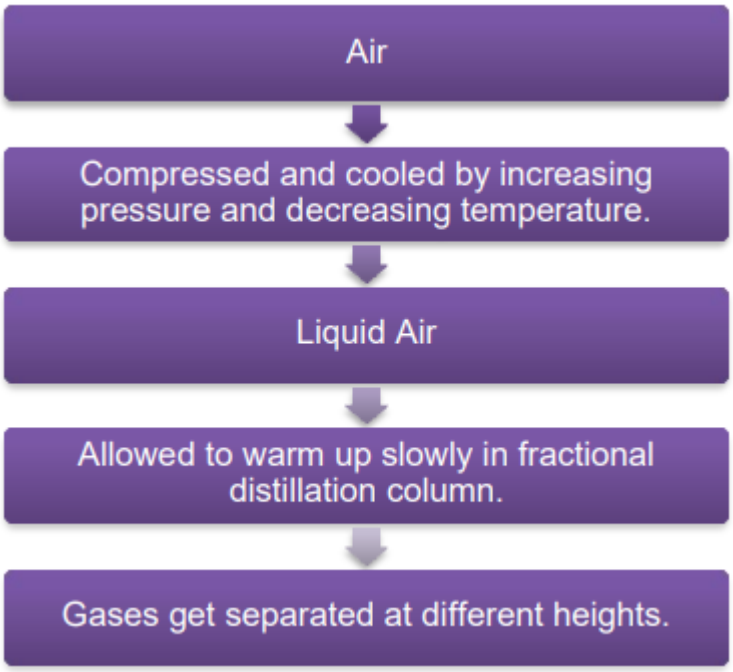
Fractional Distillation
PRINCIPLE: This method is used for the separation of gases at different heights depending upon their boiling points.

TECHNIQUE: Air is a homogeneous mixture and can be separated into its components by fractional distillation.

Air is first compressed and then cooled by increasing the pressure and decreasing the temperature.

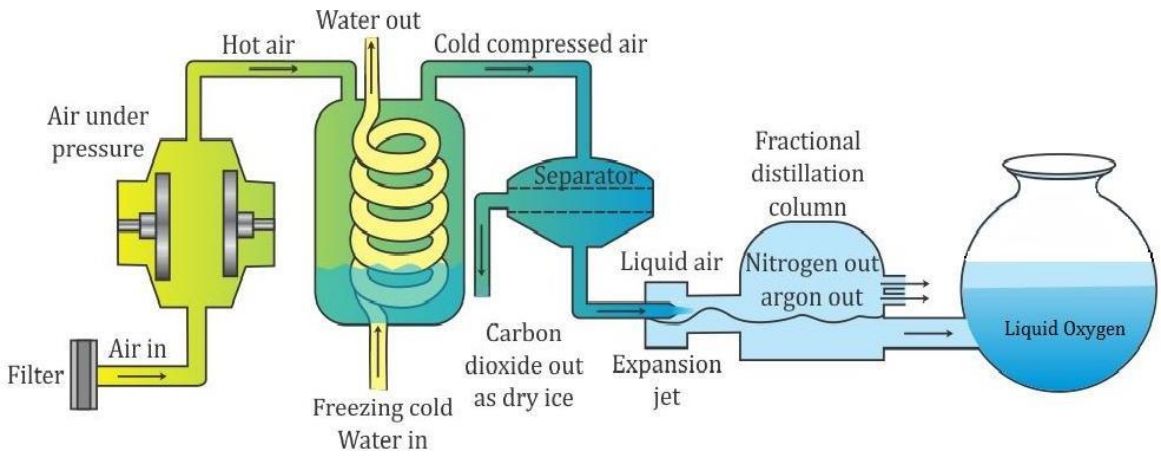
Air gets liquefied. This liquid air is allowed to warm up slowly in the fractional distillation column. Gases get separated at different heights.

Flow chart and table



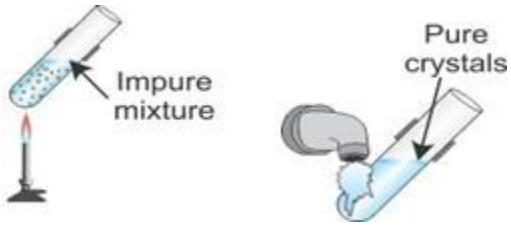
	Oxygen	Argon	Nitrogen
Boiling point (°c)	-183	-186	-196
% Air by volume	20.9	0.9	78.1

DIAGRAM:



EXAMPLE: To obtain different gases from air.

- **To Obtain Pure Copper sulphate Crystals From An Impure Sample**

Crystallisation and Fractional Crystallisation
PRINCIPLE: This method is based on the difference in the solubilities of solids in a liquid.
TECHNIQUE: This method involves dissolving the mixture completely in water and heating this mixture. Further, cooling of this mixture results in the formation of crystals of a less soluble solid on the surface of the solution. **Crystallisation:** The process of formation of crystals from a hot saturated solution by cooling. **Fractional crystallisation:** The process of separation of two solids with different solubilities.
DIAGRAM: 
EXAMPLE: Preparation of pure copper sulphate crystals in the laboratory. Purification of salt obtained from the sea. Separation of crystals of alum from impure samples.

- **To Separate The Mixture of Iron Filings and Sulphur Powder**

Magnetic Separation
PRINCIPLE: This method is based on the magnetic and non-magnetic properties of the solid particles.
TECHNIQUE: This method involves the separation of magnetic particles from non- magnetic particles using a magnet.

DIAGRAM:

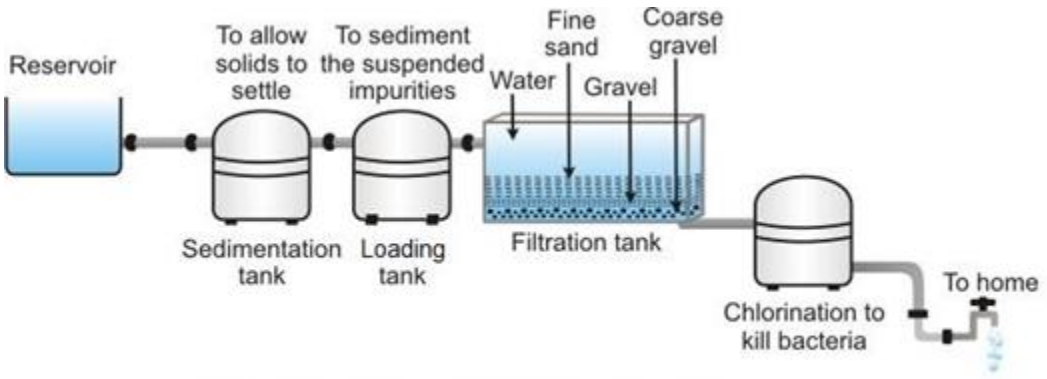
EXAMPLE: Separation of iron particles from unwanted pieces of glass, plastic or other

metallic thrash.

Purification of Drinking Water

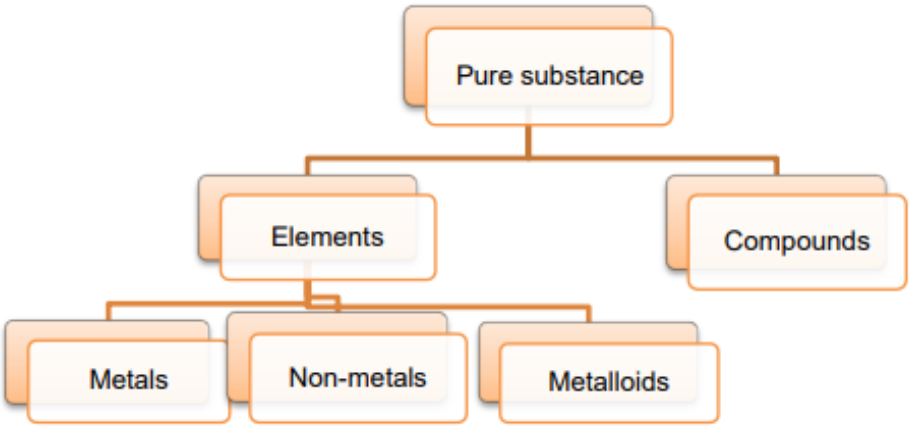
Purification of drinking water is done at the following four stages:

- Water from a river or lake is brought through canals or long pipes to the water work, where it is mixed with the required quantities of alum and soda lime solutions. These substances react with one another to form aluminium hydroxide, a jelly-like, sticky solid.
- It is then pumped into big settling tanks, where most of the suspended impurities settle down in two or three days.
- The clear water still containing some suspended matter is passed through successive filters of boulders, gravel, coarse sand and fine sand.
- The clear water from the filters is chlorinated and then passed to the reservoirs for distribution in the city.



Water purification system in water works

Physical and Chemical Changes



Element

- An element can be defined as a basic form of matter which cannot be broken down into simpler substances by any physical or chemical means.

Characteristics of an Element

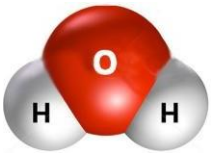
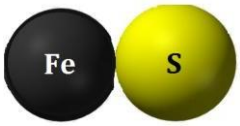
- An element is made up of only a single type of atoms.
- It is a pure and homogeneous substance.
- It has a fixed melting and boiling point.
- An atom is the smallest particle of an element which takes part in a chemical reaction.
- An element may chemically react with other elements or compounds.
- An element can occur in the solid, liquid or gaseous state.

Classification of Elements

Metals	Non-metals	Metalloids
• Have metallic lustre. • Are good conductors of heat and electricity. • Are malleable and ductile. • Are solids. • Contain one kind of atoms.(Mono-atomic) Examples: Iron, copper, sodium, calcium etc. Exceptions: 1. Zinc is non-malleable and non-ductile. 2. Mercury is a liquid at room temperature. 3. Tungsten is a poor conductor of electricity. 4. Sodium and potassium are not hard. They are so soft that they can be cut easily with a knife.	• Do not have lustre. • Are bad conductors of heat and electricity. • Are neither malleable nor ductile. • Are solids, liquids and gases. • Contain two kinds of atoms. (Mono-atomic or di-atomic) Examples: Solid: Carbon, silicon, phosphorous etc. Liquid: Bromine Gas: Hydrogen, chlorine etc. Exceptions: 1. Carbon fibre is ductile but not malleable. 2. Graphite is a good conductor of electricity. 3. Iodine and graphite are lustrous.	• Properties are midway between metals and non-metals. • Contain one kind of atoms. (Mono-atomic) Examples: Boron, germanium, silicon, arsenic, antimony, bismuth etc.

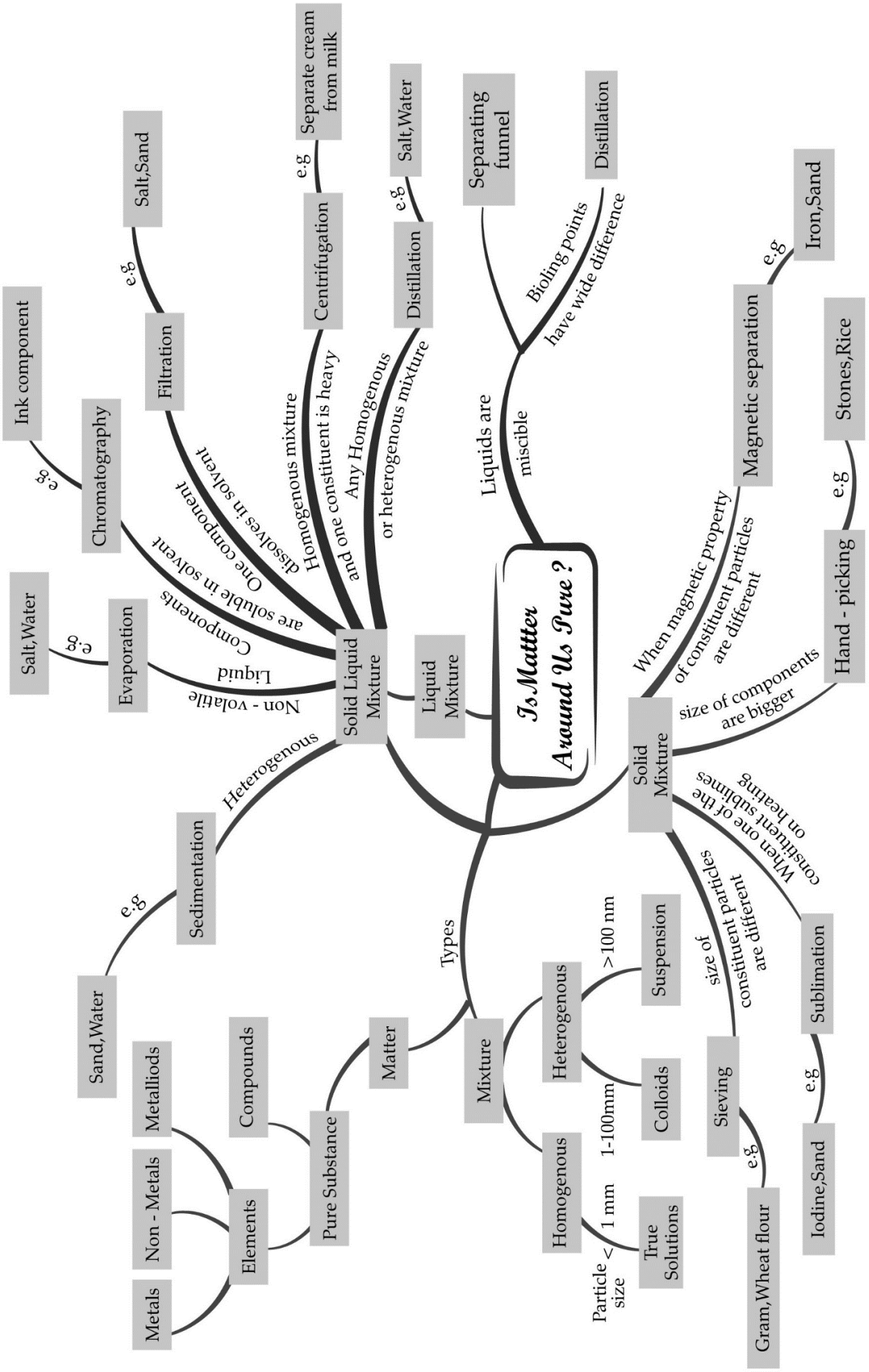
Compound

- A compound is a pure substance composed of two or more elements combined chemically in a fixed proportion by mass.
- The properties of compounds are different from the properties of their constituent elements. Example: H_2O, CO_2 etc.
- The smallest part of a compound is a molecule. All the molecules of a compound are alike and have properties similar to that of the compound.

Compound	Molecular Formula	Composition of molecule	Structure
1. Water	H_2O	2 atoms of hydrogen and 1 atom of oxygen	
2. Iron sulphide	FeS	1 atom of iron and 1 atom of sulphur	

Characteristics of Compounds

- Components in a compound are present in a definite proportion.
- A compound has a homogeneous composition.
- Particles in a compound are of one type.
- A compound is made up of one or more atoms of the same or different elements.
- In a compound the elements are present in a fixed ratio by mass.
- A compound can be divided into simpler substances by a chemical process.
- The physical and chemical properties of a compound are completely different from those of its constituents.


Is Matter Around Us Pure ?
Solid Liquid Mixture
Liquid Mixture
Solid Mixture
Liquids are miscible
Bioling points have wide difference
Separating funnel
Distillation
Salt,Water
e.g
Distillation
Any Homogenous or heterogenous mixture
and one constituent is heavy
Homogenous mixture
Centrifugation
e.g
Separate cream from milk
Salt,Sand
e.g
Filtration
dissolves in solvent
One component are soluble in solvent
Chromatography
e.g
Ink component
Salt,Water
e.g
Evaporation
Non - volatile Liquid Components
When magnetic property of constituent particles are different
Magnetic separation
e.g
Iron,Sand
e.g
Stones,Rice
Hand - picking
size of components are bigger
When one of the constituent sublimes on heating
Sublimation
e.g
Iodine,Sand
size of constituent particles are different
Sieving
e.g
Gram,Wheat flour
Types
Matter
Mixture
Heterogenous
>100 nm
Suspension
Colloids
1-100mm
Homogenous
1 mm
Particle size <
True Solutions
Pure Substance
Compounds
Elements
Metalliods
Non - Metals
Metals
Heterogenous
Sedimentation
e.g
Sand,Water

Important Questions

➢ Multiple Choice Questions:

1. What is the name of the metal which exists in liquid state at room temperature?

(a) Sodium

(b) Potassium

(c) Mercury

(d) Bromine

2. When the liquid is spun rapidly, the denser particles are forced to the bottom and the lighter particles stay at the top. This principle is used in:

(a) Centrifugation

(b) Fractional distillation

(c) Evaporation

(d) Tunneling

3. What is the name of the metal which exists in liquid state at room temperature?

(a) Mercury

(b) Bromine

(c) Sodium

(d) Potassium

4. Which of the following elements is not a metalloid?

(a) Boron

(b) Silicon

(c) Germanium

(d) Tungsten

5. If we put camphor in an open container, its amount keeps on decreasing due to the phenomenon of

(a) Evaporation

(b) Precipitation

(c) Condensation

(d) Sublimation

6. Heterogeneous mixture in which the solute particles do not dissolve and remain suspended throughout the solvent and the solute particles can be seen with the naked eye is known as:

(a) Colloidal solution

(b) Super saturated solution

(c) Sublimation

(d) Suspensions

7. In tincture of iodine, find the solute and solvent?

(a) alcohol is the solute and iodine is the solvent

(b) iodine is the solute and alcohol is the solvent

(c) any component can be considered as solute or solvent

(d) tincture of iodine is not a solution

8. The continuous zig-zag movement of colloidal particles in a dispersion medium is called

(a) Dispersion

(b) Tyndall effect

(c) Brownian movement

(d) Oscillation

9. A pure substance which is made up of only one kind of atom and cannot be broken into two or more simpler substances by physical or chemical means is referred to as

(a) a compound

(b) an element

(c) a molecule

(d) a mixture

10. Which of the following non-metal is a good conductor of electricity?

(a) Aluminium

(b) Silicon

(c) Graphite

(d) Gold

11. Which of the following property does not describe a compound?

(a) It is composed of two or more elements

(b) It is a pure substance.

(c) It cannot be separated into constituents by physical means

(d) It is mixed in any proportion by mass

12. When two liquids do not mix, they form two separate layers and are known as

(a) Miscible liquids

(b) Immiscible liquids

(c) Saturated liquids

(d) Super saturated liquids

13. How one can separate ammonium chloride from a mixture containing ammonium chloride and sodium chloride?

(a) Precipitation

(b) Sublimation

(c) Chromatography

(d) Cetrifugation

14. The amount of solute present per unit volume or per unit mass of the solution/solvent is known as

(a) Composition of solute

(b) Concentration of a solvent

(c) Concentration of a solute

(d) Concentration of a solution

15. According to the definition of pure substance, which of the following is a pure substance?

(a) Ice

(b) Mercury

(c) Iron

(d) All of these

➢ Very Short Question:

1. Define solvent.

2. Define solute.

3. What is 'tincture of iodine'?

4. What are alloys?

5. Give one example of gas in liquid solution.

6. How can a solution be dilute or concentrated?

7. What is "concentration of a solution"?

8. State the difference between aqueous and, non-aqueous solution.

9. What is "solubility" of a solute?

10. What is saturated solution?

➢ Short Questions:

1. Why is mixture called impure substance?
2. Give the differences between mixture and compound.
3. Distinguish between a physical change and chemical change.
4. State the properties of a solution.
5. State the properties of a suspension.
6. What is a colloidal solution?
7. State the properties of colloidal solution.
8. Give the applications of centrifugation.

➢ Long Questions:

1. Give the difference between true solution, colloidal solution and suspension.
2. State the different types of colloids with examples.
3. (a) Define solution.

(b) Give different types of solutions with one example each.

➢ Assertion Reason Questions:

1. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
   c. Assertion is true but Reason is false.
   d. Both Assertion and Reason are false.

   Assertion: Oxygen atom is pure substance.

   Reason: Oxygen is never found in any combine state.
2. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
   c. Assertion is true but Reason is false.

d. Both Assertion and Reason are false.

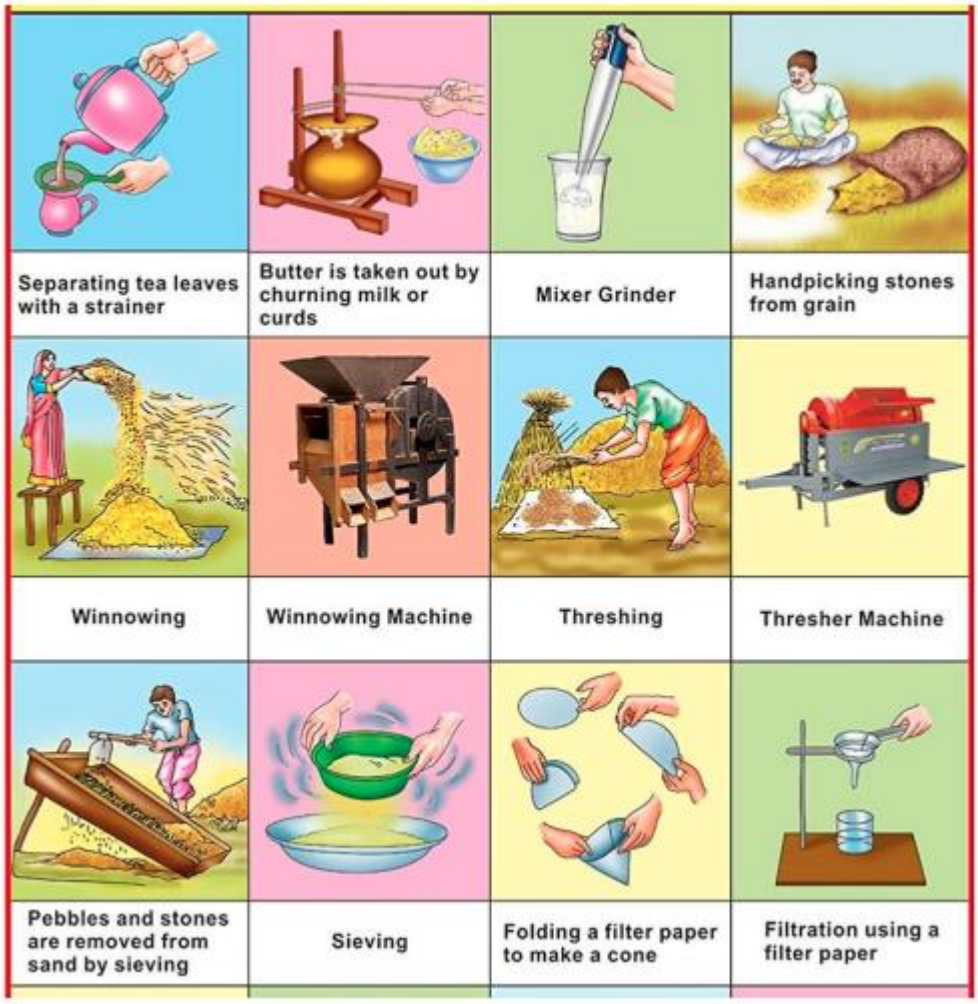
Assertion: Oxygen atom is pure substance.

Reason: Oxygen is always found in combine state.

➢ Case Study Question:

1. Read the following and answer any four questions from (i) to (v)

A Chemistry teacher explained the different types of separation of mixtures with the help of given adjoined chart. Now, in a practical test, students were provided with give samples and they were asked to separate the samples applying suitable separation methods. Now the students have to select the correct methods of separation.



(i) Fine mud particles suspended in water.

(a) Winnowing

(b) Sedimentation and Decantation.

(c) Using magnet

(d) Chlorination

(ii) Oil from water.

(a) Sedimentation and Decantation

(b) Filtration

(c) Separating funnel

(d) Winnowing

(iii) Sodium chloride from its solution in water.

(a) Filtration

(b) Separating funnel

(c) Sedimentation and Decantation

(d) Evaporation

(iv) Camphor from salt.

(a) Filtration

(b) Separating funnel

(c) Sublimation

(d) Sedimentation

(v) Cream from milk

(a) Separating funnel

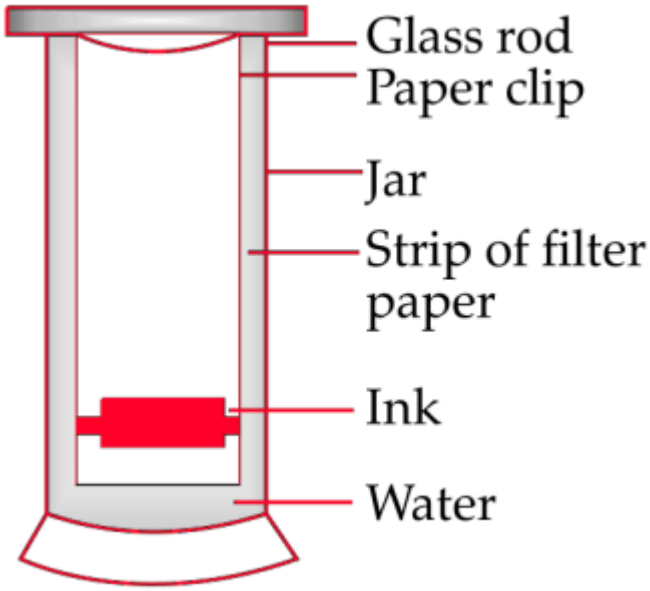
(b) Sedimentation

(c) Filtration

(d) Centrifugation

2. Read the following and answer any four questions from (i) to (v)

A child wanted to separate the mixture of dyes constituting a sample of ink. He marked a line by the ink on the filter paper and placed the filter paper in a glass containing water as shown in figure. The filter paper was removed when the water moved near the top of the filter paper.



(i) Identify the technique used by the child.

(a) Sedimentation

(b) Filtration

(c) Chromatography

(d) Distillation

(ii) What would you expect to see, if the ink contains three different coloured components?

(a) We will not see any band on the filter paper.

(b) We would see three bands on the filter paper at various lengths.

(c) We would see infinite bands on the filter paper.

(d) We would see single band on the filter paper.

(iii) Give one application where you can use this technique.

(a) To separate salt from sand

(b) To separate wheat from husk

(c) To separate oil from water

(d) To separate drugs from blood.

(iv) For the separation of what kind of substances is the above process used?

(a) For the separation of insoluble substances

(b) For the separation of single solute that dissolves in single solvent.

(c) For the separation of those solutes that dissolve in the same solvent.

(d) For the separation of those solutes that dissolve in the different solvents.

(v) What is chromatography?

(a) It is an agricultural method to separate grains

(b) A method to separate magnetic impurities from non-magnetic impurities

(c) The process of separating the suspended particles of an insoluble substance

(d) Method of separating and identifying various components in a mixture, which are present in small trace quantities.

✓ Answer Key-

➢ Multiple Choice Answers:

1. (c) Mercury
2. (a) Centrifugation
3. (b) Bromine
4. (d) Tungsten
5. (d) Sublimation
6. (d) Suspensions
7. (b) iodine is the solute and alcohol is the solvent
8. (c) Brownian movement
9. (b) an element
10. (c) Graphite
11. (d) It is mixed in any proportion by mass
12. (b) Immiscible liquids
13. (b) Sublimation
14. (d) Concentration of a solution
15. (d) All of these

➢ Very Short Answers:

1. Answer: The component of the solution that dissolves the other component in it is called the solvent.
2. Answer: The component of the solution that is dissolved in the solvent is called solute.
3. Answer: A solution of iodine in alcohol is known as tincture of iodine. It has iodine (solid) as the solute and alcohol (liquid) as the solvent.
4. Answer: The homogeneous mixture of two or more metals or a metal and non-metal is called an alloy. E.g., steel is an alloy of iron and carbon.
5. Answer: Cold-drinks, carbon dioxide gas as solute is mixed with water as a solvent.
6. Answer: The amount of solute dissolving in a solvent decides whether the solution is dilute

or concentrated.

7. Answer: The concentration of a solution is the amount of solute present in a given amount of solution or the amount of solute dissolved in a given mass or volume of solvent.
8. Answer: Aqueous solutions have water as solvent and non-aqueous solutions do not haVe water as solvent.
9. Answer: The amount of the solute present in the saturated solution at the given temperature is called its solubility.
10. Answer: The maximum amount of solute dissolved in a solvent at given temperature is called saturated solution, where no more solute can dissolve further.

➢ Short Answer:

1. Answer: Mixture consists of different components which retain their properties and can be easily separated by physical processes, hence it is called as impure substance.
2. Answer:

Mixture	Compound
1. Impure matter	1. Pure matter.
2. Constituents combine in any ratio to form mixture.	2. Constituents combine in fixed ratio to form a compound.
3. Constituents retain their properties.	3. Constituents do not retain their properties as a new substance is formed.
4. Constituents can be separated by physical processes.	4. Constituents cannot be separated by physical processes.

3. Answer:

Physical Change	Chemical Change
1. No new substance is formed.	1. New substance is formed.
2. It is a reversible change.	2. It is irreversible change.
3. The properties of constituents are retained.	3. The properties of constituents are not retained.
4. No new substance is formed.	4. Completely new substance is formed.

4. Answer: Properties of a solution are:
   - A solution is a homogeneous mixture.
   - Particles of a solution are smaller than 1 nm and cannot be seen by naked eyes.
   - Do not scatter beam of light.
   - Solute particles cannot be separated from the mixture by the process of filtration and thus, solution is stable.
5. Answer: Properties of a suspension
   - Suspension is a heterogeneous mixture having particle size greater than 100 nm.

- The particles of a suspension can be seen by naked eyes.
- Particles can scatter a beam of light.
- It is unstable.

6. Answer: It is a heterogeneous solution which appears to be homogeneous, particles size is very small and so cannot be seen with naked eyes but it is stable. E.g., milk and blood.
7. Answer: Properties of colloidal solution.
   - It is a heterogeneous mixture having particle size between 1 nm to 100 nm.
   - Size of particles is very small, cannot be seen with naked eyes.
   - It scatters a beam of light.
   - They are stable as the particles do not settle when left undisturbed.
8. Answer: Application of centrifugation are:
   - Used in diagnostic laboratories for blood and urine test.
   - Used in dairies and home to separate butter from cream.
   - Used in a washing machines to squeeze out water from wet clothes.

➢ Long Answer:

1. Answer: The difference between true solution, colloidal solution and suspension

Property	True Solution	Colloidal Solution	Suspension
1. Particle size	less than 1nm.	between 1nm and 100 nm.	more than 100 nm.
2. State	Stable	Stable	Unstable
3. Tyndall effect (Scattering of light)	No	Yes	Yes
4. Separation by filtration	Not possible	Not possible	Is possible
5. Nature	Transparent	Translucent	Translucent/opaque

2. Answer: Different colloids are formed due to different dispersed phase and dispersing

Dispersed Phase	Dispersing Medium	Type	Examples
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Sponge, pumice
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid sol	Coloured gemstone, milky glass

3. Answer:

(a) Solution: It is a homogeneous mixture of two or more substances. It consists of solute and solvent.

(b) Different types of solution:

(i) Based on solvent—Aqueous and non-aqueous Aqueous solution has water as solvent (sugar + water) Non-aqueous solution has some other solvent but not water. Example, (sulphur + carbon disulphide)

(ii) Depending on the amount of solute dissolved in solvent—Dilute solution and concentrated solution

Dilute solution: Less amount of solute particles are present in a solvent.

Concentrated solution: Amount of solute present in its maximum capacity in a solvent.

(iii) Amount of solute present in its maximum capacity at a given temperature—Saturated and unsaturated solution.

Saturated solution: It is a solution in which no more solute can further dissolve in a given solvent at a given temperature.

Unsaturated solution: It is a solution in which some more solute can dissolve in a solvent at a given temperature.

(iv) Depending on the size of solute particles

True solution	**Suspension**	**Colloid**
Size is very small and particles cannot be seen through naked eyes	Size is very big and can be seen through naked eyes	Size is intermediate between true solution and suspension

➢ Assertion Reason Answer:

1. (c) Assertion is true but Reason is false.
2. (b) Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.

➢ Case Study Answer:

1. **Answer:**

   (i) (b) Sedimentation and Decantation.

   (ii) (c) Separating funnel

   (iii) (d) Evaporation

   (iv) (c) Sublimation

   (v) (d) Centrifugation

2. **Answer:**

(i) (c) Chromatography

(ii) (b) We would see three bands on the filter paper at various lengths.

(iii) (d) To separate drugs from blood.

(iv) (c) For the separation of those solutes that dissolve in the same solvent.

(v) (d) Method of separating and identifying various components in a mixture, which are present in small trace quantities.