Class – IX CHEMISTRY Chapter-2 **IS MATTER AROUND US PURE**

Most of the matter around us exist as mixtures of two or more pure components, for example, sea water, minerals, soil etc. are all mixtures.

**What is a Mixture?**

Mixtures are made by more than one kind of pure form of matter, known as a substance.

Substance---

1) Matter having same type/only one type of particles is known as substance.

2) A substance cannot be separated into other kinds of matter by any physical process.

3) Whatever the source of a substance may be, it will always have the same characteristic properties.

Therefore, we can say that a mixture contains more than one substance.

**TYPES OF MIXTURES--On the basis of nature of the components that form a mixture,**

we have different types of mixtures.

| 1. Homogeneous mixture | 2. Heterogeneous mixture |
|---|---|
| They have uniform composition throughout. e.g. solutions. | They contain physically distinct parts and have non-uniform compositions. e.g. colloids and suspension. |

**1. Solution**

--A solution is a homogeneous mixture of two or more substances. E.g.soda water etc.

--Solutions are following types---

| Type of Solution | Solute | Solvent | Common Examples |
|---|---|---|---|
| *Gaseous Solutions* | Gas | Gas | Mixture of oxygen and nitrogen gases |
| | Liquid | Gas | Chloroform mixed with nitrogen gas |
| | Solid | Gas | Camphor in nitrogen gas |
| *Liquid Solutions* | Gas | Liquid | Oxygen dissolved in water |
| | Liquid | Liquid | Ethanol dissolved in water |
| | Solid | Liquid | Glucose dissolved in water |
| *Solid Solutions* | Gas | Solid | Solution of hydrogen in palladium |
| | Liquid | Solid | Amalgam of mercury with sodium |
| | Solid | Solid | Copper dissolved in gold |

Note--Usually we think of a solution as a liquid that contains either a solid, liquid or a gas dissolved in it.

***Alloys*:** Alloys are homogeneous mixtures of metals and cannot be separated into their components by physical methods. But still, an alloy is considered as a mixture because it shows the properties of its constituents and can have variable composition. For example, brass is a mixture of approximately 30% zinc and 70% copper.

--A solution has a solvent and a solute as its components. (usually the component present in larger Amount and Component of mixture that's physical state occupy by the solution) is called the solvent. The component of the solution that is dissolved in the solvent (usually present in lesser quantity) is called the solute.

**Examples:**

(i) A solution of sugar in water is a solid in liquid solution. In this solution, sugar is the solute and water is the solvent.

(ii) A solution of iodine in alcohol known as 'tincture of iodine', has iodine (solid) as the solute and alcohol (liquid) as the solvent. Used as antiseptics.

(iii) Aerated drinks like soda water etc., are gas in liquid solutions. These contain carbon dioxide (gas) as solute and water (liquid) as solvent.

(iv) 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.

**Properties of a solution--→•** A solution is a homogeneous mixture.

• The particles of a solution (solute and solvent both) are smaller than 1 nm ($10^{-9}$ metre) in diameter. So, they cannot be seen by naked eyes.

• Because of very small particle size, they do not scatter a beam of light passing through the solution. So, the path of light is not visible in a solution.

• The solute particles can not be separated from the mixture by the process of filtration. The solute particles do not settle down when left undisturbed, that is, a solution is stable.

**CONCENTRATION OF A SOLUTION**

Depending upon the amount of solute present in a solution, it can be called a dilute, concentrated or a saturated solution. Dilute and concentrated are comparative terms

Saturated solution—Solutions in which no more solute can be dissolved at a given temperature, it is called a saturated solution.

The amount of the solute present in the saturated solution at this temperature is called its **solubility.**

If the amount of solute contained in a solution is less than the saturation level, it is called an **unsaturated solution**.

Q. What would happen if you were to take a saturated solution at a certain temperature and cool it slowly.

Ans. Different substances in a given solvent have different solubilities at the same temperature.

So on cooling substances start to precipitate out.

**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.

***Concentration of solution = Amount of solute/Amount of solution***

There are various ways of expressing the concentration of a solution, here we will learn only two methods.

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

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

**Suspension→** Non-homogeneous systems, in which solids are dispersed in liquids, are called Suspensions so It is a heterogeneous mixture.

**Properties of a Suspension---→•** Suspension is a heterogeneous mixture.

• The particles of a suspension can be seen by the naked eye.

• The particles of a suspension scatter a beam of light passing through it and make its path visible.

• The solute particles settle down when a suspension is left undisturbed, that is, a suspension is unstable.

* They can be separated from the mixture by the process of filtration.

**COLLOIDAL SOLUTION-→**

The particles of a colloid are uniformly spread throughout the medium. They have relatively smaller size of particles, as compared to that of a suspension, so the mixture appears to be homogeneous. But actually, a colloidal solution is a heterogeneous mixture, The particles are called the dispersed phase and the medium in which they are distributed is called the dispersion medium. for example, milk.

**Properties of a colloids--→•** Colloid is a heterogeneous mixture

• The particles of a colloids can be seen by the naked eye.

• They do not settle down when left undisturbed, that is, a colloid is quite stable.

• The particles of a colloids scatter a beam of light passing through it and make its path visible.

This scattering of a beam of light is called the **Tyndall effect** after the name of the scientist who discovered this effect.

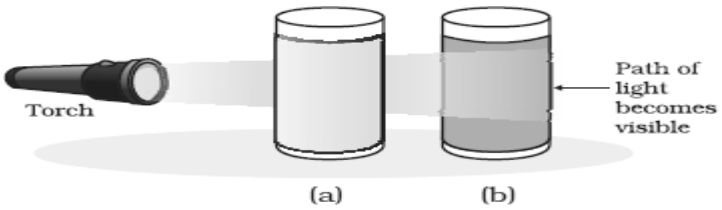



**Fig.**

(a) Solution of copper sulphate does not show Tyndall effect,

(b) mixture of water and milk shows Tyndall effect.

* They can not be separated from the mixture by the process of filtration.

**Tyndall effect can be observed** when (1) sunlight passes through the canopy of a dense forest. In the forest, mist contains tiny droplets of water, which act as particles of colloid dispersed in air.

(2) A fine beam of light enters a room through a small hole. This happens due to the scattering of light by the particles of dust and smoke in the air.

**Table : Common examples of colloids**

| Dispersed phase | Dispersing Medium | Type | Example |
|---|---|---|---|
| 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 | Foam, rubber, sponge, pumice |
| Liquid | Solid | Gel | Jelly, cheese, butter |
| Solid | Solid | Solid Sol | Coloured gemstone, milky glass |

**Separating the Components of a Mixture**

Most of the natural substances are not chemically pure. Different methods of separation are used to get individual components from a mixture.

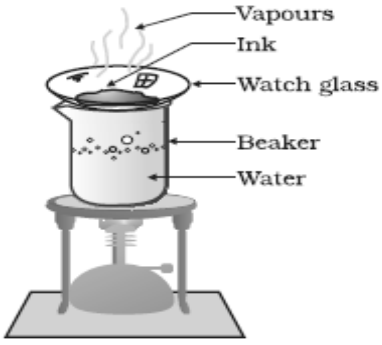
**Importance of separation→** To study and to use the individual components of a mixture.

Heterogeneous mixtures can be separated into their respective constituents by simple physical methods like handpicking, sieving, filtration that we use in our day-to-day life.

**Q. HOW CAN WE OBTAIN COLOURED COMPONENT (DYE) FROM BLUE/ BLACK INK?**

**Ans. By evaporation method--**

Experiment-- • Fill half a beaker with water. • Put a watch glass on the mouth of the Beaker. • Put few drops of ink on the watch glass. • Now start heating the beaker. We do not heat the ink directly. We will see that evaporation is taking place from the watch glass. • Continue heating as the evaporation goes on and stop heating when no further change on the watch glass.




Observation—Ink remains on the watch glass.

*Q• What do you think has got evaporated from the watch glass?*

*Ans. Water (Solvent) has got evaporated from the watch glass.*

*Q• Is there a residue on the watch glass? Ans. Yes.*

*Q• What is your interpretation? Is ink a single substance (pure) or is it a mixture?*

*Ans. It is a mixture.*

Conclusion---We find that 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.

**HOW CAN WE SEPARATE CREAM (fat) FROM MILK?**

Now-a-days, we get full-cream, toned and double-toned varieties of milk packed in polypacks or tetra packs in the market. These varieties of milk contain different amounts of fat.

***Activity--*** • Take some full-cream milk in a test tube. • Centrifuge it by using a centrifuging machine for two minutes or a milk churner in the kitchen.

**The principle** is that the denser particles are forced to the bottom and the lighter particles stay at the top when spun rapidly.

*Q• What do you observe on churning the milk? Ans. Cream get separated from milk.*

*Q• Explain how the separation of cream from milk takes place.*

*Ans.* The denser particles of water and others are forced to the bottom and the lighter particles of cream/fats stay at the top when spun rapidly. (Note—We use this method when filtration is not possible.)

**Applications-→**• Used in diagnostic laboratories for blood and urine tests.

• Used in dairies and home to separate butter from cream.

• Used in washing machines to squeeze out water from wet clothes.

**HOW CAN WE SEPARATE A MIXTURE OF TWO IMMISCIBLE LIQUIDS?**

**By using a separating funnel.**

**The principle** is that immiscible liquids separate out in layers depending on their densities.

***Activity*** → Separation of kerosene oil from water using a separating funnel.

• Pour the mixture of kerosene oil and water in a separating funnel (Fig.) • Let it stand undisturbed for sometime so that separate layers of oil and water are formed. • Open the stopcock of the separating funnel and pour out the lower layer of water carefully. • Close the stopcock of the separating funnel as the oil reaches the stop-cock.

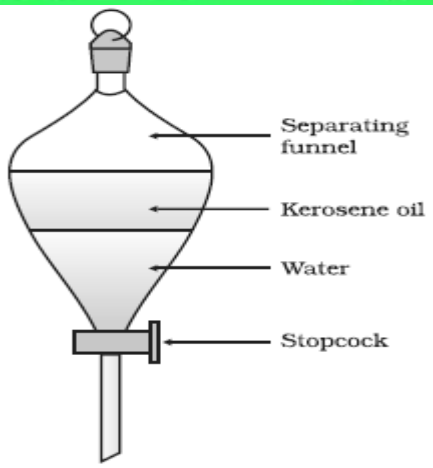



***Fig:*** *Separation of immiscible liquids*

**Applications-→**• To separate mixture of oil and water.

• In the extraction of iron from its ore, the lighter slag is removed from the top by this method to leave the molten iron at the bottom in the furnace.

**HOW CAN WE SEPARATE A MIXTURE OF SALT AND AMMONIUM CHLORIDE?**

**By sublimation method** as we know ammonium chloride is a sublimating substance.

So, to separate such mixtures that contain a sublimable volatile component from a non-sublimable impurity (salt in this case), the sublimation process is used (Fig.). Some examples of solids which sublime are ammonium chloride, camphor, naphthalene and anthracene.

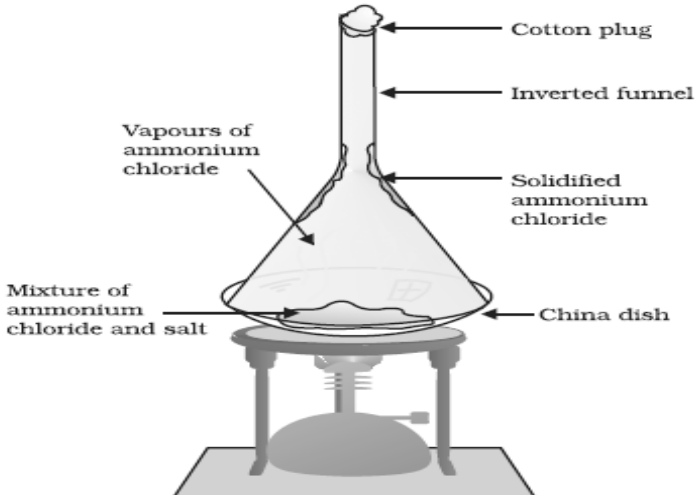



***Fig:*** *Separation of ammonium chloride and salt*

**Q. IS THE DYE IN BLACK INK A SINGLE COLOUR?**

Ans. Dye in black ink is a mixture of different compounds.

These different compounds can be separated by **chromatography method.**

***Activity-→*** • Take a thin strip of filter paper. • Draw a line on it using a pencil, approximately 3 cm above the lower edge [Fig (a)]. • Put a small drop of ink (water soluble, that is, from a sketch pen or fountain pen) at the centre of the line. Let it dry. • Lower the filter paper into a jar/glass/ beaker/test tube containing water so that the

drop of ink on the paper is just above the water level, as shown in Fig. (b) and leave it undisturbed. • Watch carefully, as the water rises up on the filter paper.

Observation-- Different components (red and green ink) of ink get separated.

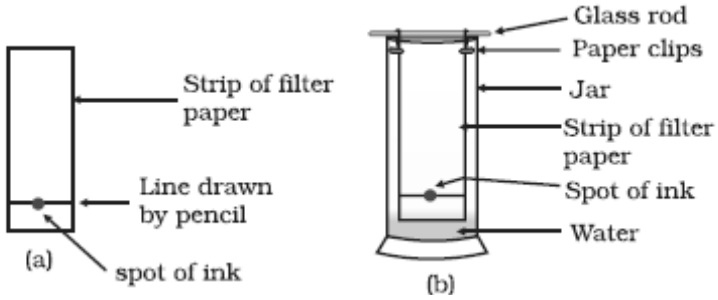



**Fig.** Separation of dyes in black ink using chromatography

**<u>This process of separation of components of a mixture is known as chromatography.</u>**

*Kroma* in Greek means colour. This technique was first used for separation of colours, so this name was given.

**Chromatography is the technique** used for separation of those solutes that dissolve in the same solvent.

**Applications→** To separate

• colours in a dye • pigments from natural colours • drugs from blood.

*Q• What do you observe on the filter paper as the water rises on it?*

Ans. Different components (red and green ink) of black ink get separated.

*Q• Do you obtain different colours on the filter paper strip? Ans. Yes.*

*Q• What according to you, can be the reason for the rise of the coloured spot on the paper strip?*

Ans. The ink that we use has water as the solvent and the dye is soluble in it. As the water rises on the filter paper it takes along with it the dye particles. Usually, a dye is a mixture of two or more colours. The coloured component that is more soluble in water, rises faster and in this way the colours get separated.

**HOW CAN WE SEPARATE A MIXTURE OF TWO MISCIBLE LIQUIDS?**

We use distillation method. Principle→ This method is used for the separation of components of a mixture containing two miscible liquids that boil without decomposition and have sufficient difference in their boiling points. (Note- And mixture should not be **Azeotropic** (constant boiling).

***Activity*→** • We have to separate acetone and water from their mixture. • Take the mixture in a distillation flask. Fit it with a thermometer. • Arrange the apparatus as shown in Fig. • Heat the mixture slowly keeping a close watch at the thermometer. • The acetone vaporises, condenses in the condenser and can be collected from the condenser outlet. • Water is left behind in the distillation flask.

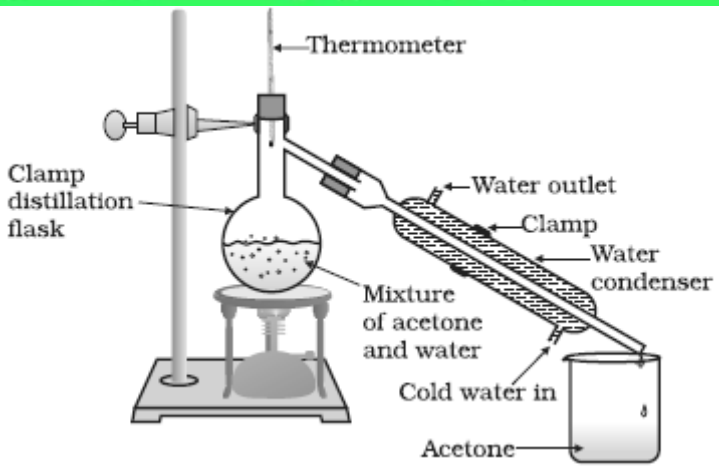



***Fig:*** *Separation of two miscible liquids by Distillation*

*Q• What do you observe as you start heating the mixture?*

*Ans. Vapours start to form in round bottam flask.*

*Q• At what temperature does the thermometer reading become constant for some time?*

*Ans. At the boiling point of acetone (56 $^0$C)*

*Q• What is the boiling point of acetone? Ans. 56 $^0$C*

*Q• Why do the two components separate?*

*Ans. Because they have different boiling points and the maximum evaporation takes place at the boiling point.*

**To separate a mixture of two or more miscible liquids for which the difference in boiling points is less than 25 K**,

**Fractional distillation** process is used, for example,

1. for the separation of different gases from air, 2. different factions from petroleum products etc.

The apparatus is similar to that for simple distillation, except that a fractionating column is fitted in between the distillation flask and the condenser.

A simple **fractionating column** is a tube packed with glass beads. The beads provide surface for the vapours to cool and condense repeatedly, as shown in Fig.

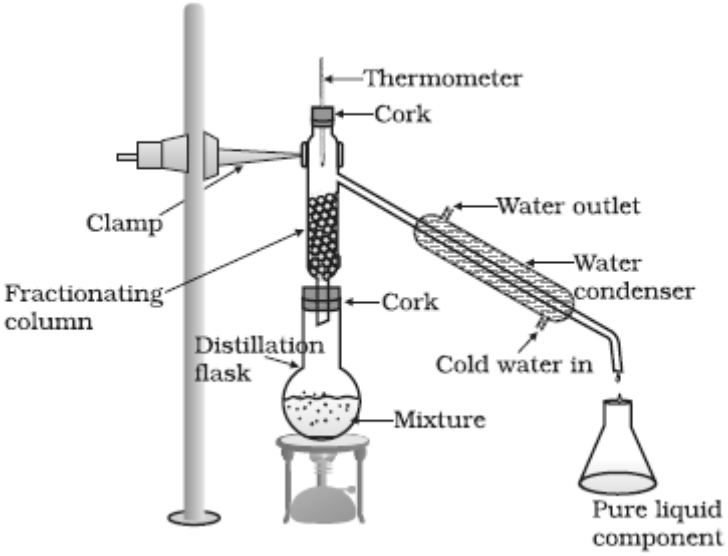
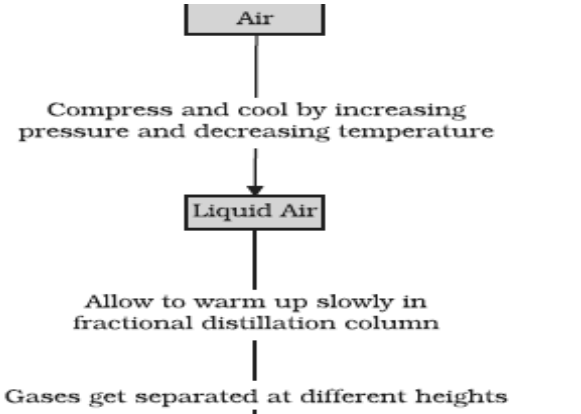



***Fig. :*** *Fractional distillation*

**HOW CAN WE OBTAIN DIFFERENT GASES FROM AIR ?**

Air is a homogeneous mixture and can be separated into its components by fractional distillation. The flow diagram (Fig.) shows the steps of the process.




| | Oxygen | Argon | Nitroge |
|---|---|---|---|
| Boiling Point (°C) | −183 | −186 | −196 |
| % Air by Volume | 20.9 | 0.9 | 78.1 |

***Fig.:*** *Flow diagram shows the process of obtaining gases from air*

**HOW CAN WE OBTAIN PURE COPPER SULPHATE FROM AN IMPURE SAMPLE?**

**By crystallization** method. Crystallisation is a process that separates a pure solid in the form of its crystals from a solution. Hence this method is used to purify solids.

***Activity*** • Take some (approximately 5 g) impure sample of copper sulphate in a china dish. • Dissolve it in minimum amount of water. • Filter the impurities out. • Evaporate water from the copper sulphate solution so as to

get a saturated solution. • Cover the solution with a filter paper and leave it undisturbed at room temperature to cool slowly for a day.

Observation -→• We get the blue crystals of copper sulphate in the china dish.

*Q• Do the crystals look alike? Ans. Yes.*

*Q• How will you separate the crystals from the liquid in the china dish? Ans. By filtration method.*

**Crystallisation technique is better than simple evaporation technique as –**

• 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. On evaporation these contaminate the solid.

**Applications**

• Purification of salt that we get from sea water. • Separation of crystals of alum (*phitkari*) from impure samples.

**Physical and Chemical Changes**

The properties that can be observed and specified like colour, hardness, rigidity, fluidity, density, melting point, boiling point etc. are the physical properites.

**A physical change** brings changes in the physical properties of the matter.

It may or may not be reversible.

**Chemical change** brings change in the chemical properties of matter and we get new substances. A chemical change is also called a chemical reaction.

----During burning of a candle, both physical and chemical changes take place.

----Melting and evaporation of wax are the physical changes and burning of the wax is a chemical change.

**What are the Types of Pure Substances?**

Matter made up of same type of particles known as pure substances / substances**.**

On the basis of their chemical composition, substances can be classified as elements or compounds.

**ELEMENTS--- Robert Boyle** was the first scientist to use the term element in 1661. **Antoine Laurent Lavoisier** (1743-94), a French chemist, who gave the first definition of an element.

'An element as a basic form of matter that cannot be broken down into simpler substances by chemical reactions''.

Elements can be normally divided into metals, non-metals and metalloids.

**Properties of Metals -→**

• They have a lustre (shine). • They have silvery-grey or golden-yellow colour.

• They conduct heat and electricity.

• They are ductile (can be drawn into wires).

• They are malleable (can be hammered into thin sheets).

• They are sonorous (make a ringing sound when hit).

Examples of metals are gold, silver, copper, iron, sodium, potassium etc. **Mercury is the only metal that is liquid at room temperature.**

**Properties of Non-Metals**

• They display a variety of colours. • They are poor conductors of heat and electricity.

• They are not lustrous, sonorous or malleable.

Examples of non-metals are hydrogen, oxygen, iodine, carbon (coal, coke), bromine, chlorine etc. Metalloids-

→Some elements have intermediate properties between those of metals and non-metals, they are called metalloids; examples are boron, silicon, germanium etc.

**COMPOUNDS**

A compound is a substance composed of two or more elements, chemically combined with one another in a fixed proportion.

Q. What do we get when two or more elements are combined? Ans. We get a compound.

***Activity*--•**Make two groups . Give 50 g of iron filings and 3 g of sulphur powder in a china dish to both the groups.

**Group I** • Mix and crush iron filings and sulphur powder.

**Group II** • Mix and crush iron filings and sulphur powder. Heat this mixture strongly till red hot. Remove from flame and let the mixture cool.

**Groups I and II (Observation)**

| | |
|---|---|
| **1.** Check for magnetism | Content with gr. I show magnetism. |
| | Content with gr. II does not show magnetism. |
| 2. Colour | Gr. I – Yellow with black spots. |
| | Gr. II – Black |
| • Add carbon disulphide to one part of the material obtained. Stir well and filter. | Gr.-I Yellow solution of S in $CS_2$ and iron filings get separated. |
| | Gr. II- Material does not dissolve in $CS_2$. |
| • Add dilute sulphuric acid or dilute hydrochloric acid to the other part of the material obtained | Gr. I- Material -→ **Iron** reacts with acids and release $H_2$ g. |
| | Reac.→ $Fe + 2HCl \rightarrow FeCl_2 + H_{2\,g}$ |
| | Gr. II- Whole material reacts with acids. |
| | Reac. → $FeS + 2HCl \rightarrow FeCl_2 + H_2Sg$ |

Note• When we Perform all the above steps with both the elements (iron and sulphur) separately, we obtain results according to gr. I.

Q• *Did the material obtained by the two groups look the same? Ans. No.*

*Q• Which group has obtained a material with magnetic properties? Ans. Gr. I*

*Q• Can we separate the components of thematerial obtained? Ans. Yes in gr. I, By magnet. And No in gr. II.*

*Q• On adding dilute sulphuric acid or dilute hydrochloric acid, did both the groups obtain a gas? Did the gas in both the cases smell the same or different?*

Ans. The gas obtained by Group I is hydrogen, it is colourless, odourless and combustible–

The gas obtained by Group II is hydrogen sulphide. It is a colourless gas with the smell of rotten eggs.

Conclusion-→ The products obtained by both the groups show different properties, though the starting materials were the same. Group I has carried out the activity involving a physical change whereas in case of Group II, a chemical change (a chemical reaction) has taken place.

• The material obtained by group I is a **mixture** of the two substances. The substances given are the elements– iron and sulphur.

• The properties of the **mixture** are the same as that of its constituents.

• The material obtained by group II is a **compound**.

• On heating the two elements strongly we get a **compound**, which has totally different properties compared to the combining elements.

• The composition of a compound is the same throughout.

**Table 2.2: Mixtures and Compounds**

| Mixtures | Compounds |
|---|---|
| 1. Elements or compounds just mix together to form a mixture and no new compound is formed. | 1. Elements react to form new compounds. |
| 2. A mixture has a variable composition. | 2. The composition of each new substance is always fixed. |
| 3. A mixture shows the properties of the constituent substances. | 3. The new substance has totally different properties. |
| 4. The constituents can be seperated fairly easily by physical methods. | 4. The constituents can be separated only by chemical or electrochemical reactions. |

**Exxercise**

**1.** Which of the following statements are true for pure substances?

(i) Pure substances contain only one kind of particles

(ii) Pure substances may be compounds or mixtures

(iii) Pure substances have the same composition throughout

(iv) Pure substances can be exemplified by all elements other than nickel

(a) (i) and (ii) (b) (i) and (iii)

(c) (iii) and (iv) (d) (ii) and (iii)

**2.** Rusting of an article made up of iron is called

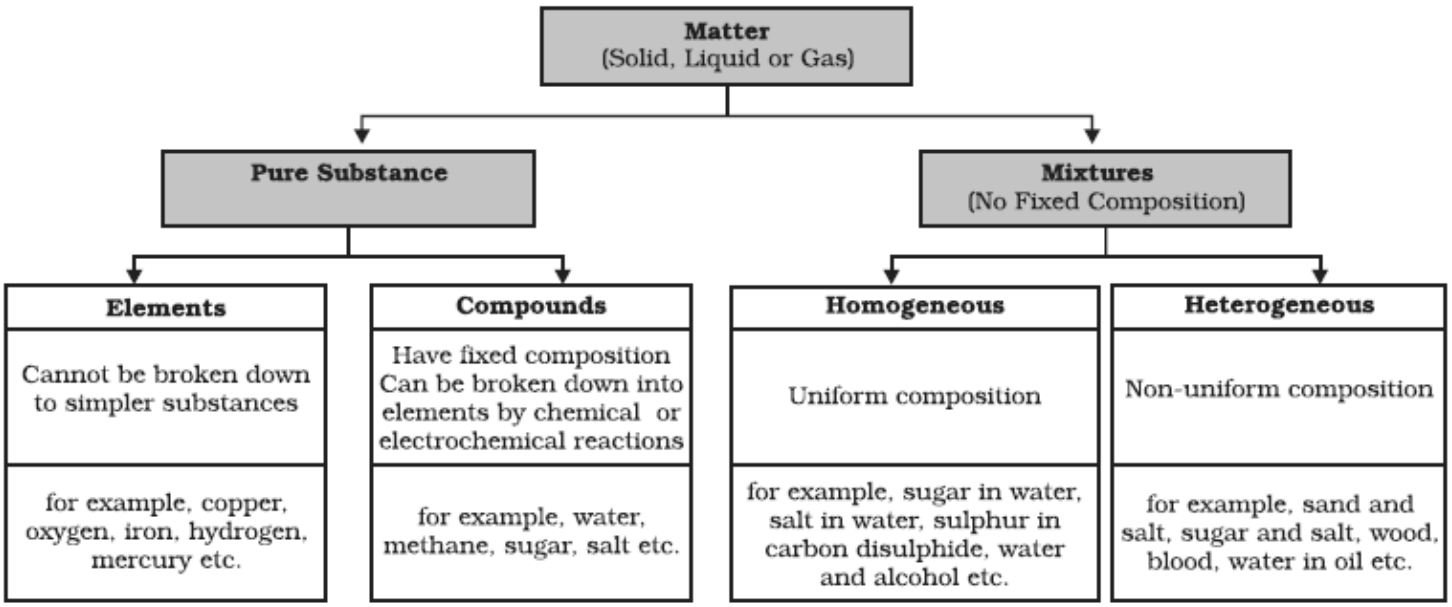
(a) corrosion and it is a physical as well as chemical change

(b) dissolution and it is a physical change

(c) corrosion and it is a chemical change

(d) dissolution and it is a chemical change

**Classification of matter-→**




**3.** A mixture of sulphur and carbon disulphide is

(a) heterogeneous and shows Tyndall effect

(b) homogeneous and shows Tyndall effect

(c) heterogeneous and does not show Tyndall effect

(d) homogeneous and does not show Tyndall effect

**4.** Tincture of iodine has antiseptic properties. This solution is made by dissolving

(a) iodine in potassium iodide (b) iodine in vaseline

(c) iodine in water (d) iodine in alcohol

**5.** Which of the following are homogeneous in nature?

(i) ice (ii) wood (iii) soil (iv) air

(a) (i) and (iii) (b) (ii) and (iv)

(c) (i) and (iv) (d) (iii) and (iv)

**6.** Which of the following are physical changes?

(i) Melting of iron metal (ii) Rusting of iron

(iii) Bending of an iron rod (iv) Drawing a wire of iron metal

(a) (i), (ii) and (iii) (b) (i), (ii) and (iv)

(c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)

**7.** Which of the following are chemical changes?

(i) Decaying of wood (ii) Burning of wood

(iii) Sawing of wood (iv) Hammering of a nail into a piece of wood

(a) (i) and (ii) (b) (ii) and (iii)

(c) (iii) and (iv) (d) (i) and (iv)

**8.** Two substances, A and B were made to react to form a third substance, $A_2B$ according to the following reaction

$2\ A + B \rightarrow A_2B$

Which of the following statements concerning this reaction are incorrect?

(i) The product $A_2B$ shows the properties of substances A and B

(ii) The product will always have a fixed composition

(iii) The product so formed cannot be classified as a compound

(iv) The product so formed is an element

(a) (i), (ii) and (iii), (b) (ii), (iii) and (iv)

(c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)

**9.** Two chemical species X and Y combine together to form a product P which contains both X and Y i.e.

$X + Y \rightarrow P$

X and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y and P are correct?

(i) P is a compound (ii) X and Y are compounds

(iii) X and Y are elements (iv) P has a fixed composition

(a) (i), (ii) and (iii), (b) (i), (ii) and (iv)

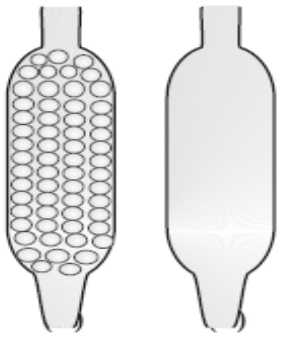
(c) (ii), (iii) and (iv) (d) (i), (iii) and (iv)

**10.** Suggest separation technique(s) one would need to employ to separate the following mixtures.

(a) Mercury and water (b) Potassium chloride and ammonium chloride

(c) Common salt, water and sand (d) Kerosene oil, water and salt

**11.** Which of the tubes in Fig. 2.1 (a) and (b) will be more effective as a condenser in the distillation apparatus?



(a) (b)

**12**. Salt can be recovered from its solution by evaporation. Suggest some other technique for the same?

**13**. The 'sea-water' can be classified as a homogeneous as well as heterogeneous mixture. Comment.

**14**. While diluting a solution of salt in water, a student by mistake added acetone (boiling point 56°C). What technique can be employed to get back the acetone? Justify your choice.

**15.** What would you observe when

(a) a saturated solution of potassium chloride prepared at 60°C is allowed to cool to room temperature.

(b) an aqueous sugar solution is heated to dryness.

(c) a mixture of iron filings and sulphur powder is heated strongly.

**16**. Explain why particles of a colloidal solution do not settle down when left undisturbed, while in the case of a suspension they do.

**17.** Smoke and fog both are aerosols. In what way are they different?

**18.** Classify the following as physical or chemical properties

(a) The composition of a sample of steel is: 98% iron, 1.5% carbon and 0.5% other elements.

(b) Zinc dissolves in hydrochloric acid with the evolution of hydrogen gas.

(c) Metallic sodium is soft enough to be cut with a knife.

(d) Most metal oxides form alkalis on interacting with water.

**19**. The teacher instructed three students 'A', 'B' and 'C' respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50g of NaOH in 100 mL of water, 'B' dissolved 50g of NaOH in 100g of water while 'C' dissolved 50g of NaOH in water to make 100 mL of solution. Which one of them has made the desired solution and why?

**20.** Name the process associated with the following

(a) Dry ice is kept at room temperature and at one atmospheric pressure.

(b) A drop of ink placed on the surface of water contained in a glass spreads throughout the water.

(c) A potassium permanganate crystal is in a beaker and water is poured into the beaker with stirring.

(d) A acetone bottle is left open and the bottle becomes empty.

(e) Milk is churned to separate cream from it.

(f) Settling of sand when a mixture of sand and water is left undisturbed for some time.

(g) Fine beam of light entering through a small hole in a dark room, illuminates the particles in its paths.

**21**. You are given two samples of water labelled as 'A' and 'B'. Sample 'A' boils at 100°C and sample 'B' boils at 102°C. Which sample of water will not freeze at 0°C? Comment.

**22**. What are the favourable qualities given to gold when it is alloyed with copper or silver for the purpose of making ornaments?

**23**. An element is sonorous and highly ductile. Under which category would you classify this element? What other characteristics do you expect the element to possess?

**24**. Give an example each for the mixture having the following characteristics. Suggest a suitable method to separate the components of these mixtures

(a) A volatile and a non-volatile component.

(b) Two volatile components with appreciable difference in boiling points.

(c) Two immiscible liquids.

(d) One of the components changes directly from solid to gaseous state.

(e) Two or more coloured constituents soluble in some solvent.

**25**. Fill in the blanks

(a) A colloid is a ——— mixture and its components can be separated by the technique known as ———.

(b) Ice, water and water vapour look different and display different —— properties but they are ——— the same.

(c) A mixture of chloroform and water taken in a separating funnel is mixed and left undisturbed for some time. The upper layer in the separating funnel will be of——— and the lower layer will be that of ———.

(d) A mixture of two or more miscible liquids, for which the difference in the boiling points is less than 25 K can be separated by the process called———.

(e) When light is passed through water containing a few drops of milk, it shows a bluish tinge. This is due to the —— of light by milk and the phenomenon is called ——— . This indicates that milk is a ——— solution.

**26.** Sucrose (sugar) crystals obtained from sugarcane and beetroot are mixed together. Will it be a pure substance or a mixture? Give reasons for the same.

**27**. Give some examples of Tyndall effect observed in your surroundings?

**28**. Can we separate alcohol dissolved in water by using a separating funnel? If yes, then describe the procedure. If not, explain.

**29.** On heating calcium carbonate gets converted into calcium oxide and carbon dioxide.

(a) Is this a physical or a chemical change?

(b) Can you prepare one acidic and one basic solution by using the products formed in the above process? If so, write the chemical equation involved.

**30.** Non metals are usually poor conductors of heat and electricity. They are non-lustrous, non-sonorous, non-malleable and are coloured.

(a) Name a lustrous non-metal.

(b) Name a non-metal which exists as a liquid at room temperature.

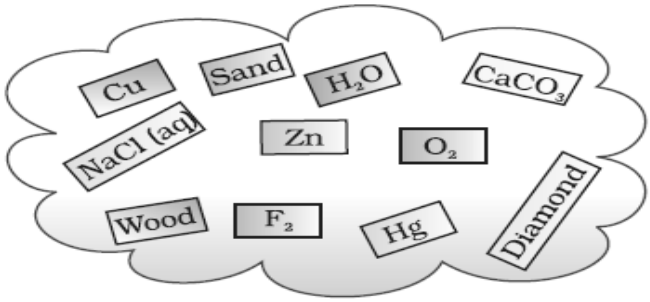
(c) The allotropic form of a non-metal is a good conductor of electricity. Name the allotrope.

(d) Name a non-metal which is known to form the largest number of compounds.

(e) Name a non-metal other than carbon which shows allotropy.

(f) Name a non-metal which is required for combustion.

**31.** Classify the substances given in Fig into elements and compounds




**32.** Which of the following are not compounds?

(a) Chlorine gas (b) Potassium chloride (c) Iron (d) Iron sulphide

(e) Aluminium (f) Iodine (g) Carbon (h) Carbon monoxide (i) Sulphur powder

**33.** Fractional distillation is suitable for separation of miscible liquids with a boiling point difference of about 25 K or less. What part of fractional distillation apparatus makes it efficient and possess an advantage over a simple distillation process. Explain using a diagram.

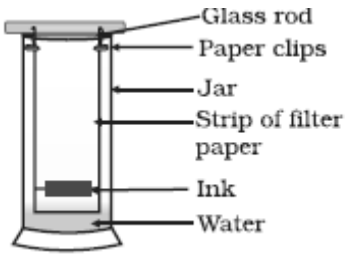
**34.** (a) Under which category of mixtures will you classify alloys and why?

(b) A solution is always a liquid. Comment.

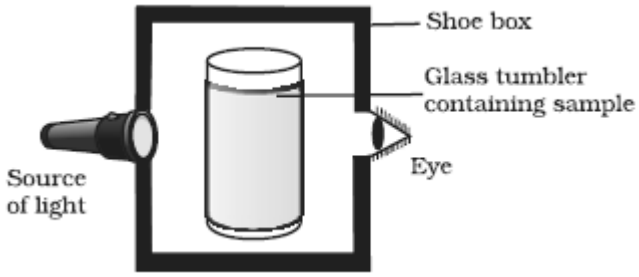
(c) Can a solution be heterogeneous?

**35.** Iron filings and sulphur were mixed together and divided into two parts, 'A' and 'B'. Part 'A' was heated strongly while Part 'B' was not heated. Dilute hydrochloric acid was added to both the Parts and evolution of gas was seen in both the cases. How will you identify the gases evolved?

**36.** 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
Fig.. The filter paper was removed when the water moved near the top of the filter paper.
(i) What would you expect to see, if the ink contains three different coloured components?
(ii) Name the technique used by the child.
(iii) Suggest one more application of this technique.




**37.** A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a milk sample contained in a beaker/tumbler in the box as shown in the Fig.. They were amazed to see that milk taken in the tumbler was illuminated. They tried the same activity by taking a salt solution but found that light simply passed through it?
(a) Explain why the milk sample was illuminated. Name the phenomenon involved.
(b) Same results were not observed with a salt solution. Explain.
(c) Can you suggest two more solutions which would show the same effect as shown by the milk solution?




**38**. Classify each of the following, as a physical or a chemical change. Give reasons.
(a) Drying of a shirt in the sun.
(b) Rising of hot air over a radiator.
(c) Burning of kerosene in a lantern.
(d) Change in the colour of black tea on adding lemon juice to it.
(e) Churning of milk cream to get butter.

**39**. During an experiment the students were asked to prepare a 10% (Mass/Mass) solution of sugar in water. Ramesh dissolved 10g of sugar in 100g of water while Sarika prepared it by dissolving 10g of sugar in water to make 100g of the solution.

(a) Are the two solutions of the same concentration

(b) Compare the mass % of the two solutions.

**40.** You are provided with a mixture containing sand, iron filings, ammonium chloride and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture?

**41.** Arun has prepared 0.01% (by mass) solution of sodium chloride in water. Which of the following correctly represents the composition of the solutions?

(a) 1.00 g of NaCl + 100g of water

(b) 0.11g of NaCl + 100g of water

(c) 0.0l g of NaCl + 99.99g of water

(d) 0.10 g of NaCl + 99.90g of water

**42**. Calculate the mass of sodium sulphate required to prepare its 20% (mass percent) solution in 100g of water?