APPOINTMENT / MEETING

Class VIII
Subject - Chemistry
Chapter-3 Element, Compound and mixture part-5

Date - 16.5.20

(1) What is Paper Chromatography?

(2) Which is act as stationary and mobile phase in paper Chromatography?

(3) Give the advantages and disadvantages of Chromatography.

(4) Give the prineiple of liquid gas to separate mixture. Give eg.

(5) What is Diffusion?

(6) What is Solvent extraction? Give eg.

(7) What is Liquefaction? Give eg.

NOTES

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16.6.20

Fractional distillation is a process which involves distillation and collection of fractions of different liquids which are boiling at different temperatures.

Note : Homogeneous liquid-liquid mixtures are called *miscible* liquids.

- Liquids which dissolve in each other completely in all proportions are called miscible liquids. *Example* – alcohol is miscible with water.
- Liquids which do not dissolve in each other are called immiscible liquids. They are heterogeneous liquid-liquid mixtures. *Example* – oils are immiscible with water.

3. Chromatography : This is one of the latest techniques to separate the components of a mixture when all the components are very similar in their properties.

Example : Components of ink are separated by this method. Ink is a mixture of different dyes, which are separated by chromatography because some of the dyes are less soluble and some are more soluble in a solvent.

The name "chromatography" means colour writing. It is named so, because earlier it was used to separate mixtures containing coloured components only but now this technique is applied to colourless substances as well.

The process of separating different dissolved constituents of a mixture by their adsorption on an appropriate material is called chromatography.

This method is based on the differences in the rates of adsorption of different components on the surface of a suitable adsorbent.

Common adsorbents used are filter paper, silica gel, etc.

Common solvents used are water, ethyl alcohol, acetic acid, etc.

Principle involved in chromatography

Chromatography separates the components of a mixture on the basis of differences between two phases, one of which is stationary while the other is mobile.

The simplest type of chromatography is **"Paper chromatography".**

In this method, a special type of paper called chromatographic paper or Whatman filter paper is taken. A line is drawn with the pencil near the bottom edge of the paper. A drop of the mixture is placed on the filter paper above this line. The paper is then dipped in a solvent, taken in a beaker, such that the line drawn on the paper is above the level of the solvent.

The filter paper acts as "stationary phase" while the solvent acts as "mobile phase".

As the solvent rises on the paper, it takes along with it the constituent substances of the mixture. The component of the mixture which is more soluble rises faster. We see various spots on the filter paper each indicating a component of the mixture. The paper is then removed from the solvent and dried.

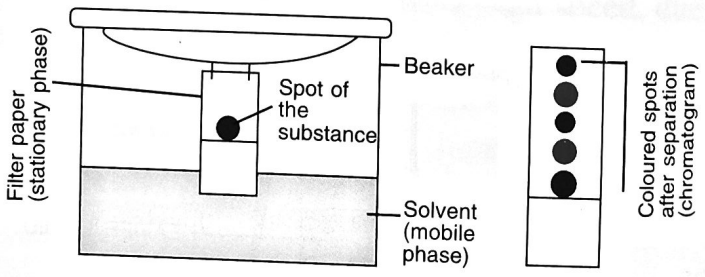

Fig. 3.13 Paper chromatography

Advantges of chromatography

- A very small quantity of the substance can be separated.
- Components with very similar physical and chemical properties can be separated.
- It identifies the different constituents of a mixture.
- It also helps in quantitative estimation of components of a mixture.

Applications of chromatography

Chromatography can be used

1. to separate,
   (a) colours in a dye
   (b) drugs from blood
   (c) pigments from natural colours.
2. to purify many industrial products.

(D) Separation of liquid-gas mixtures

A liquid-gas mixture is separated by boiling it. Dissolved gas escapes from the liquid on heating or boiling.

"The principle is based on the fact that, the solubility of a gas in a liquid decreases with an increase in temperature."

Example : Drinking water contains air dissloved in it. On boiling, air escapes from it, and the boiled water becomes tasteless.

(D) Separation of gas-gas mixtures

1. Diffusion : This method depends upon the differences in the densities of the gases present in the mixture. The lighter gas diffuses more rapidly compared to the heavier one.

A mixture of hydrogen and oxygen can be separated by diffusion as hydrogen is lighter than oxygen and diffuses first.

> The spreading out and intermixing of one substance with another substance due to the motion of its particles is called diffusion.

2. Solvent extraction : This method depends upon the fact that some gases dissolve in water or in some other solvent, while some gases do not or are less soluble.

Example : a mixture of carbon dioxide and carbon monoxide can be separated by this method as carbon dioxide is highly soluble in water while carbon monoxide is sparingly soluble.

3. Liquefaction : This method is based upon the fact that some gases like ammonia, carbon dioxide, etc. liquify easily at high pressure and low temperature while others are not easily liquefied.

Example : A mixture of ammonia and nitrogen can be separated by this method as ammonia is liquefied easily, leaving behind nitrogen gas.

Table 3.7 : Some mixtures, their methods of separation and the principle of separation

Types of mixture	Nature of mixture	Example of mixture	Method	Principle of sepration
Solid + solid	Heterogeneous	Iron + Sand	Magnetic separation	Iron being magnetic in nature gets attracted to a magnet.
Solid + solid	Heterogeneous	Iodine + Common salt	Sublimation	Iodine sublimes.

Solid + solid	Heterogeneous	Common salt + sand	Solvent extraction	Common salt dissolves in water.
Solid + solid	Heterogeneous	Potassium nitrate + common salt	Fractional crystallisation	Potassium nitrate is more soluble than common salt in water.
Solid + liquid	Heterogeneous	Clay + water	Sedimentation and decantation	Clay settles down as a sediment.
Solid + liquid	Heterogeneous	Chalk + water	Filtration	Chalk is obtained as a residue and water as a filtrate.
Solid + liquid	Homogeneous	Common salt and water	Evaporation	Common salt is non-volatile while water evaporates.
Solid + liquid	Homogeneous	Iodine + ethyl alcohol	Distillation	Ethyl alcohol vaporises and is obtained as a distillate.
Liquid + liquid	Heterogeneous	Kerosene oil + water	Separating funnel	They are immiscible liquids forming two layers, water forming the lower layer.
Liquid + liquid	Homogeneous	Ethyl alcohol + water	Fractional distillation	They differ in their boiling points.
Liquid + gas	Homogeneous	Water + carbon dioxide	Boiling	Solubility of carbon dioxide decreases on heating.
Gas + gas	Homogeneous	Nitrogen + oxygen	Liquefaction	The two gases liquify under high pressure at different temperatures.

RECAPITULATION

- There are various kinds of substances which can be pure and impure.
- A pure substance is homogeneous with a definite composition and definite physical and chemical properties.
- Elements and compounds are pure substances.
- Elements are made up of only one kind of atoms. They cannot be broken into more simpler substances.
- There are four types of elements *i.e.* metals, non-metals, metalloids and inert gases.
- Most of the elements are metallic in nature, non-metals are very less in number.
- Compounds are pure substances formed by the chemical combination of atoms of different elements in a definite proportion. Hence, compounds are made up of different types of atoms.
- Compounds can be broken into their component elements or more simpler compounds by chemical methods.
- A mixture is an impure substance.
- A mixture can be homogeneous or heterogeneous.

- Separation of components of mixtures is necessary for their purposeful use.
- Separation of components of mixtures depends upon the type of mixtures and their characteristic properties.
- Mixtures can be solid-solid, solid-liquid, liquid-liquid, liquid-gas and gas-gas mixtures.
- Various methods are applied to separate the components of mixtures. Some of them are : magnetic separation, solvent extraction, distillation, crystallisation, sedimenation and decantation, filtration, sublimation, by separating funnel, chromatography, etc.
- Chromatography is one of the latest techniques used to separate the components which are very similar in their properties.
- Gas-gas mixtures are separated by diffusion, solvent extraction and liquefaction.

EXERCISE 3(B)

1. Classify the following substances into compounds and mixtures :

Carbon dioxide, air, water, milk, common salt, blood, fruit juice, iron sulphide.

2. Give one example for each of the following types of mixtures.

(a) solid-solid homogeneous mixture

(b) solid-liquid heterogeneous mixture

(c) misicible liquids

(d) liquid-gas homogeneous mixture

3. Suggest a suitable technique to separate the constituents of the following mixtures. Also give the reason for selecting the particular method.

(a) Salt from sea water

(b) Ammonium chloride from sand

(c) Chalk powder from water

(d) Iron from sulphur

(e) Water and alcohol

(f) Sodium chloride and potassium nitrate

(g) Calcium carbonate and sodium chloride

4. *(a)* Define 'mixture'.

(b) Why is it necessary to separate the constituents of a mxiture ?

(c) State four differences between compounds and mixtures.

5. *(a)* What is chromatography ? For which type of mixture is it used ?

(b) What are the advantages of chromatography ?

(c) Give two applications of chromatography.

6. Choose the most appropriate answer from the options given below :

(a) a mixture of sand and ammonium chloride can be separated by

(i) filtration *(ii)* distillation

(iii) sublimation *(iv)* crystallisation

(b) A pair of metalloids are

(i) Na and Mg *(ii)* B and Si

(iii) C and P *(iv)* He and Ar

(c) Which of the following property is not shown by compounds ?

(i) They are heterogeneous.

(ii) They are homogeneous.

(iii) They have definite molecular formulae.

(iv) They have fixed melting and boiling points.

(d) A solvent of Iodine is

(i) Water *(ii)* Kerosene oil

(iii) Alcohol

(iv) Petrol

(e) This gas is highly soluble in water

(i) Ammonia *(ii)* Nitrogen

(iii) Carbon monoxide

(iv) Oxygen