B. Mixtures and separation of the compon

Most of the subtances that we come across in our daily life are impure. In these substances some other substances are present in smaller amounts. They are **mixtures** made up of elements, compounds or elements and compounds by mixing them without any chemical combination.

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The substances which form mixtures are called components or constituents of mixtures.

Example : Air is a mixture. Its constitutents are oxygen, nitrogen, carbon dioxide, water vapour, dust particles etc. All these constituents retain their individual properties.

Activity 6

Identify the mixtures from the following list : Air, water, sugar, salt, milk, tea, alcohol, honey, soil, glucose.

Kinds of Mixtures

We come across different kinds of mixtures in our day-to-day life. Some of them quite obviously look like mixtures.

Example : In a mixture of salt and sugar, or sand and water, one can easily recognize the two components.

But there are mixtures in which we cannot see the components.

Example : Sugar solution. We cannot see sugar and water separately in the solution.

Hence, mixtures are divided into *two* main types :

1. Heterogeneous mixtures
2. Homogeneous mixtures.

Heterogeneous Mixtures

A mixture in which the components or constituents are not uniformly distributed throughout its volume and can be easily recognized separately is called a ***heterogeneous mixture.***

Example : Soil is a heterogeneous mixture of many elements and compounds. Its composition changes from place to place. That is why we find different substances in the soil at different places.

Other examples of heterogeneous mixtures are water and petrol, sand and common salt, sulphur and iron fillings.

A mixture of two or more solids (if they do not react with each other), is always considered as a heterogeneous mixture, no matter you mix and grind them thoroughly.

Homogeneous Mixtures

A mixture in which its constituents are uniformly distributed throughout its volume and cannot be recognized separately is called a homogeneous mixture.

Example : A salt solution is a mixture made up of salt and water, but we cannot see salt particles and water separately. If we add one, two or three spoonfuls of salt in a glass of water and stir it, in each case, the solution formed is homogeneous but the proportion of salt and water is not the same.

We come across many substances which are thought to be pure. But actually, they are impure, homogeneous mixtures. *Example* : tap water, milk, air, honey, fruit juice, ice-cream, ink, medicines, bronze, brass, butter, cough syrup, *etc*. A mixture of two or more gases is always considered a homogeneous mixture because all gases mix with each other in all proportions.

Milk Tap-water Honey Ice-cream Tea

Fig. 3.1 Mixtures that look like pure substances.

Do You Know ?

1. **Tap water** is not pure because it contains small amounts of dissolved salts and air in it which we cannot see. They add taste to water. (*Pure water has no taste*).
2. **Ink** is a mixture of many dyes depending on required shades and applications.
2. **Milk** is made of fats, carbohydrates, proteins, salts, vitamins and water present in different proportions. Cream floats on milk when it is cooled after boiling.
3. **Honey** contains sugar and a number of other substances.
4. **Fruit juice** is a mixture of sugar, salts and other organic compounds.
5. **Medicines** are made by mixing different pure substances in different proportions.
6. **Alloys** are homogeneous mixtures of two or more metals or non-metals prepared by mixing them in molten state, *e.g.*
   (a) Brass is an alloy of copper and zinc.
   (b) Bronze is an alloy of copper, tin and zinc.

Characteristics of mixtures

1. In mixtures, components are loosely held together without any chemical force acting on them or between them. Hence components retain their individual properties.

   Examples : **(1)** In a mixture of salt and chilli powder, salt particles retain their salty taste and chilli powder particles retain their hot and bitter taste.

   (2) In a mixture of salt and sugar, both the components retain their salty and sweet taste respectively.

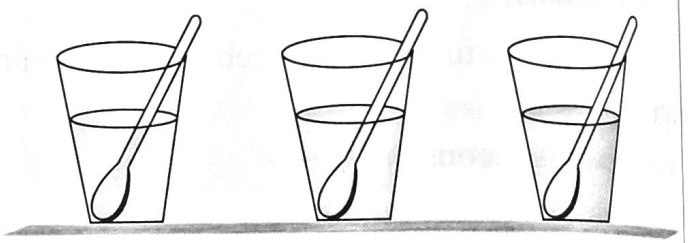
   Above two examples indicate that atoms and molecules of the components forming a mixture remain separate, retain their properties and do not form any new substance.

2. Mixtures do not have any fixed amount of components *i.e.* they can have their components in varying proportions.

   Example : A mixture of sugar and water can be formed by mixing varying proportions of these two substances.

Activity 7

Take three glasses. Fill three-fourth of each glass with water. Add a spoonful of lime juice to the first glass and stir it properly so that lime juice mixes well with water. To the second glass, add two spoons of lime juice and stir it. To the third glass, add three spoons of lime juice and stir it. Now taste all the *three* lime solutions you have prepared. You will find that all samples are sour to taste but the degree of sourness is different. In each case, we are getting a homogeneous mixture of lime juice and water but they differ in their tastes due to the difference in the ratio of water and lime juice in them.



I	II	III
A glass with one spoon of lime juice in water (sour)	A glass with two spoons of lime juice in water (more sour than I)	A glass with three spoons of lime juice in water (more sour than both I and II)

3. Mixtures do not have any specific set of properties.

   Example : In a mixture of rice and wheat, both the components can be easily recognized because together they do not show any definite set of properties.

4. Components of mixtures can be separated by simple physical methods.

   Example : Salt solution is a mixture of salt and water. When this solution is heated, water gets evaporated leaving behind salt.

5. *The melting point or the boiling point of a mixture is not fixed. It depends on the proportions of its components present in it e.g. pure water boils at 100°C but salty water boils at a higher temperature than 100°C.*

6. *Mixtures can be heterogeneous or homogeneous.*

7. Formation of mixtures *does not involve any energy exchange.*

DIFFERENCES BETWEEN COMPOUNDS AND MIXURES

To understand the differences between mixtures and compounds, let us take the following activity.

Activity 8

Comparison of a mixture of iron and sulphur and their compound iron sulphide

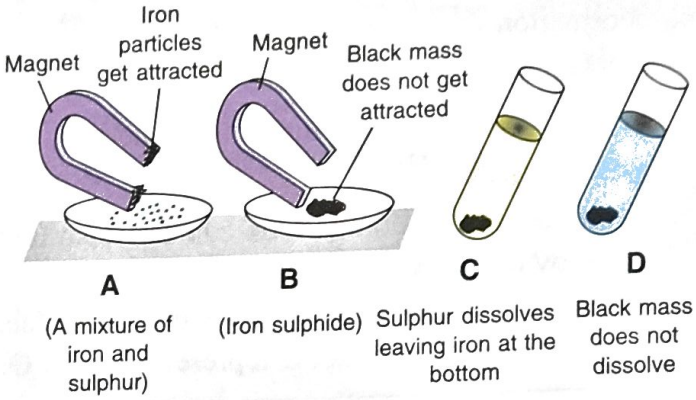
To be demonstrated by the teacher to make the difference between compounds and mixtures more clear.

Mix 56 g of iron filings and 32 g of sulphur thoroughly in a mortar and place some portion of it on a watch glass. We shall call it Sample **A**. Now take the remaining portion of the sample in a test tube and heat the bottom of the test tube. The black mass formed is put on another watch glass. We shall call it sample **B**.

(a) Bring a magnet over sample A and sample B. What do you observe ?

In sample A iron is attracted by the magnet whereas in sample B nothing happens.

(b) Put portions of sample A and sample B in carbon disulphide taken in two separate test tubes. What do you notice ?



In sample A sulphur dissolves in carbon disulphide while sample B settles down in the test tube without dissolving.

Therefore, it is clear that in sample A iron and sulphur particles retain their individual properties. However, in sample B, on heating, iron chemically combines with sulphur forming iron sulphide. Therefore, in iron sulphide, iron and sulphur particles do not exist separately as such. They lose their individual properties.

The above experiments confirm that there are two ways in which different kinds of matter can be made to combine.

(i) They can be merely brought together in any proportion and mixed to form a **mixture**.

(ii) They may be heated or allowed to react chemically to form a **compound**.

Table 3.4 Differences between compounds and mixtures

Compound	*Mixture*
1. A compound is a pure substance.	1. A mixture is an impure substance.
2. Compounds are always homogeneous	2. Mixtures may be homogeneous or heterogeneous.
3. A compound has a fixed composition, *i.e.*, it is formed when two or more pure substances chemically combine in a definite ratio by mass.	3. A mixture has no fixed composition, *i.e.*, it is formed by mixing two or more substances in any ratio without any chemical reaction.
4. Formation of a compound involves change in energy.	4. Formation of a mixture does not involve any change in energy.
5. Compounds have specific set of properties.	5. Mixtures do not have any specific set of properties.
6. Components of compounds can be separated only by complex chemical processes.	6. Components of mixtures can be separated by **simple physical methods**.
7. Compounds have definite molecular formulae. *e.g.* a molecule of water is represented by H_2O.	7. Mixtures have no definite formula *e.g.* air.

FORMATION OF MIXTURES AND TYPES OF MIXTURES ON THE BASIS OF STATES OF COMPONENTS

Various types of mixtures are formed by mixing solid, liquid and gaseous substances in different proportions on the basis of their properties and uses. Mixtures may exist in any of the three states of matter i.e. solid, liquid or gas, depending upon the physical states of its components.

Table 3.5 Examples of mixtures and their types

S. No.	States of components	Types of mixtures	Examples
(i)	Solid + solid	Heterogeneous	Sand and sugar, sand and salt, sand and stone, *etc.*
		Homogeneous	Brass, bronze, stainless steel, (all alloys), *etc.*
(ii)	Solid + liquid	Heterogeneous	Sand and water, charcoal and water, *etc.*
		Homogeneous	Sugar in water, salt in water, iodine in alcohol, *etc.*
(iii)	Liquid + liquid	Heterogeneous	Oil in water.
		Homogeneous	Alcohol and water, acetone and water, *etc.*
(iv)	Gas + liquid	Homogeneous	Aerated drinks like cold drinks, beer, *etc.*
(v)	Gas + gas	Homogeneous	Pure air
(vi)	Solid + gas	Heterogeneous	Smoke (contains soot particles in air).

APPOINTMENT / MEETING

Chapter-3 Date - 4.6.20

Class - VII

Elements, Compond and mixture part 2

(1) Cohat is mixture? Give an eg.

(2) Cohat is homogereaus mixture? Give an eg.

(3) Cohat is hetarogereaus mixture? Give an eg.

(4) Give the characteristics of mixture

(5) Give the Comparison of a mixture of iron and Sulphide and their Compound Iron Sulphide.

(6) Give the differences between Compoond and mixture.

(7) Give the eg. of the following mixture

(a) Solid + Solid homogeneaus mixture

(b) Solid + Solid hetarogeneaus mixture

(c) Solid + liquid Hetarogeneaus mixtare

(d) Solid + liquid homogeneaus mixture.

NOTES

APPOINTMENT / MEETING

(e) Liquid + Liquid heterogeneous mixture

(f) Liquid + Liquid homogeneous mixture

(g) Gas + Liquid homogeneous mixture

(h) Gas + Gas homogeneous mixture

(i) Solid + gas heterogeneous.

(8) What are the purposes for the separation of the components of the mixture?

P.S
4.6.20