

CLASS

:- IX

SUBJECT

:- SCIENCE

CHAPTER - 3



ATOMS AND MOLECULES

No. of Modules : 3

Module -1/3

- Laws of Chemical Combinations.



1) Laws of chemical combination :- There are two laws of chemical combinations:

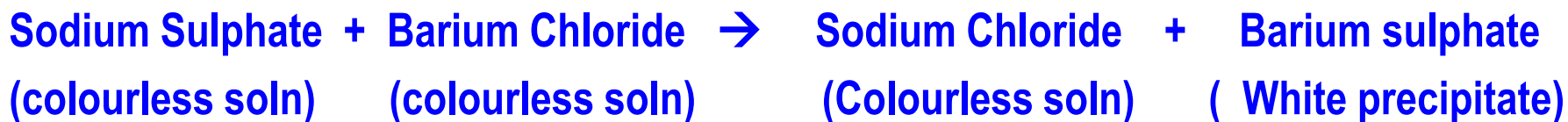
Law of conservation of mass :- states that 'Mass can neither be created nor destroyed in a chemical reaction'.

This means that during a chemical reaction the sum of the masses of the reactants and products remain unchanged.

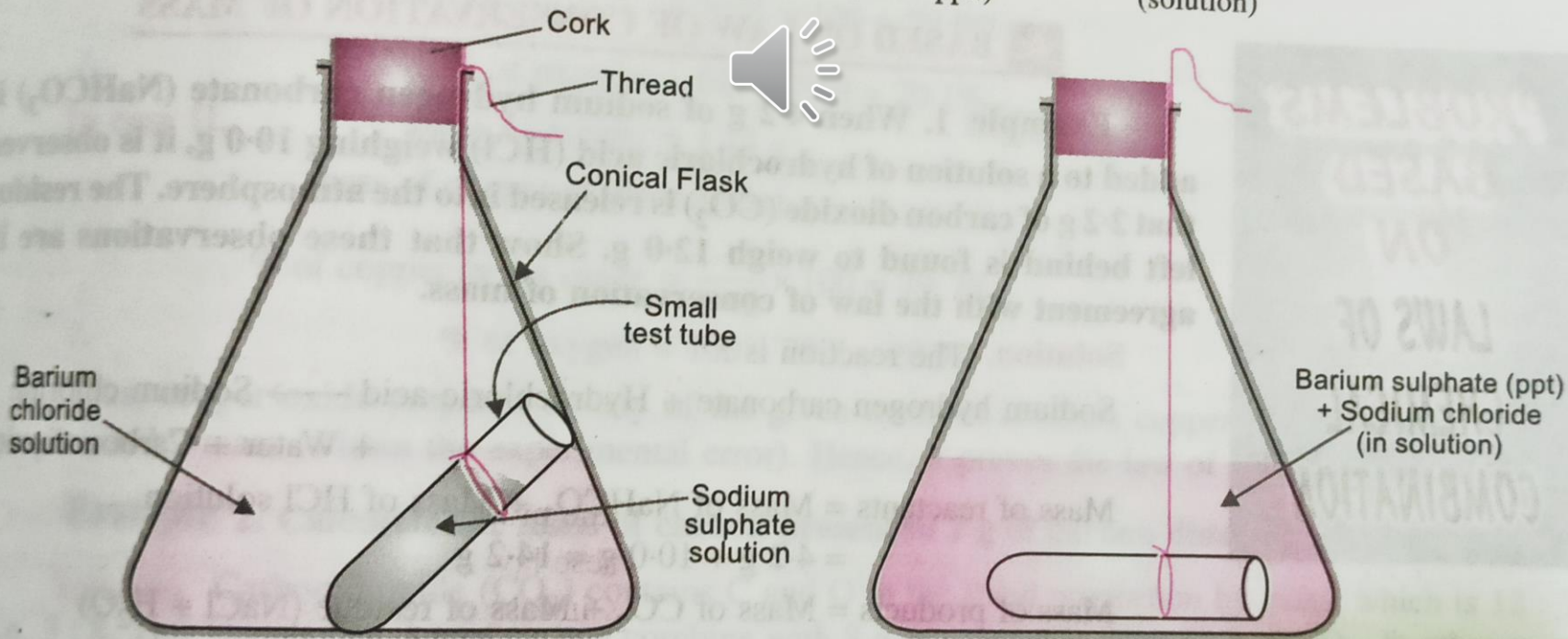
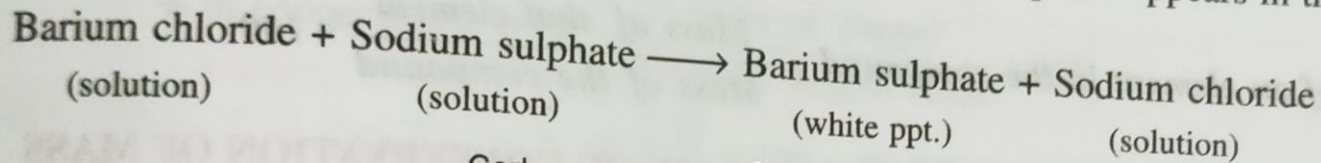
Activity :-

Take some sodium sulphate solution (colourless solution) in a conical flask and some barium chloride solution (colourless solution) in an ignition tube. Hang the ignition tube in the flask by a thread and put a cork on the flask. Find the mass of the flask on a balance.

Then tilt the flask. A chemical reaction takes place.



. Then find the mass of the flask again. It will be seen that the sum of the masses of the reactants and products remain unchanged.



(a) Before reaction

(b) After reaction

Illustration based on Law of conservation of mass

Calcium Carbonate (CaCO_3) on heating decomposes to form Calcium oxide (CaO) quick lime, and Carbon dioxide (CO_2). It is found that if 100 g of calcium carbonate is heated, it gives 56 g of Calcium oxide (CaO) quick lime and 44 g Carbon dioxide. Thus, for the reaction,

Calcium carbonate \rightarrow Calcium oxide + Carbon dioxide

100g 56g + 44g

mass of reactants = mass of product = 100g

Thus, total mass of reactants = total mass of products

This shows that no mass is created or destroyed in this chemical reaction.

ii) Law of constant proportions :- In a chemical substance, the elements are always present in a definite proportions by mass.

Eg :- Water (H_2O) always contains two elements, hydrogen and oxygen combined together in the ratio of 2:16 or 1:8 by mass. i.e 18 g of pure water will always contain 2 g of hydrogen and 16 g of oxygen irrespective of the source.

Pure Ammonia (NH_3) will always contain Nitrogen and Hydrogen combined together in the ratio of 14:3 by mass irrespective of its source from which it is obtained.



This implies that any pure sample of a compound, no matter the source, will always consists of the same elements that are present in the same ratio by mass.

Illustration of law of constant proportions:

Carbon dioxide can be prepared by any one of the following methods:

- a) By burning charcoal in air ($C + O_2 \rightarrow CO_2$)
- b) By heating Limestone ($CaCO_3 \rightarrow CaO + CO_2$)
- c) By adding dilute hydrogen chloride on any carbonate.



- d) By heating Sodium bicarbonate ($2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$)

It is found that in each case , Carbon dioxide is found to be made up of the same elements, i.e., Carbon and Oxygen combined in the same fixed ratio, i.e., 12 : 32 or 3 : 8 by mass.

Thus the Law of Constant Proportions is proved.

It also helps us to calculate the percentage of any element in the given compound, using the expression:

$$\% \text{ of an element in the compound} = \frac{\text{Mass of that element}}{\text{Mass of the compound}} \times 100$$

To be continued in module 2