



# 1 Chemical Reactions

## INTRODUCTION

### Law of Chemical Combination

Since early seventeenth century, the scientists were trying to establish the basis of chemical combination between the atoms of elements to form different compounds. As a result of the vast researches carried by the them, they came to the conclusion that these chemical combinations are based upon certain laws. These are known as laws of chemical combination. A number of laws have been proposed after thorough experimental studies. One of them is Law of Conservation of Mass.

### Law of Conservation of Mass

We know that in a chemical reaction, the reactants combine to form the products. The law deals with the mass of the reactants and of the products participating in a chemical reaction. It was given by a French chemist A. Lavoisier in 1774. He is known as the father of Chemistry.

According to the law:

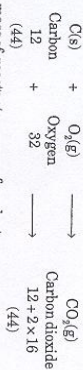
"The total mass of the products is equal to the mass of the reactants in a chemical reaction".

The law may also be stated as-

"The mass can neither be created nor destroyed in a chemical reaction".

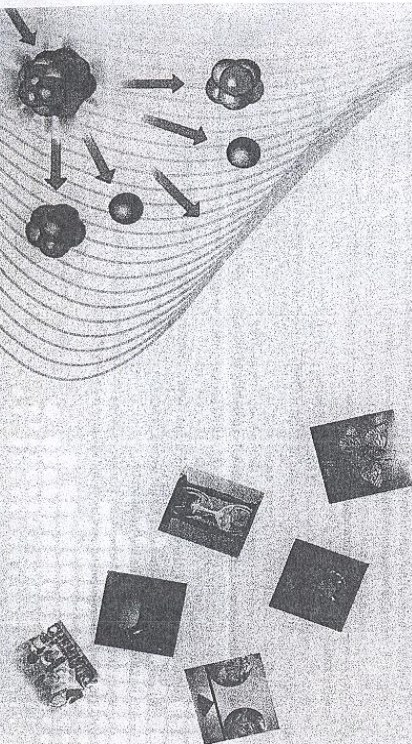
In other words, the mass remains unchanged or conserved in a chemical reaction. The law is also known as "Law of Indestructibility of Matter".

For example



Therefore, mass of reactants = mass of products.

# CHEMISTRY



# Experiment 1

AIM

To verify the law of conservation of mass in a chemical reaction.

## MATERIALS REQUIRED

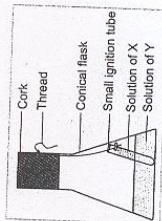
Weighing balance, conical flask, small ignition tube, thread, cork to fit into the flask, 100 ml beakers, barium chloride and zinc sulphate.

## THEORY

The law of conservation of mass states that "mass can neither be created nor destroyed in a chemical reaction". In other words "the total mass of the products is always equal to the total mass of the reactants in a chemical reaction".

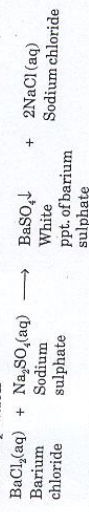
## Method

1. Prepare a 5% solution of barium chloride and 5% of sodium sulphate in two beakers separately.
2. Take a little amount (5 ml) of sodium sulphate in the conical flask.
3. Take a little amount of (2 ml) of barium chloride in a small ignition tube. Hang the ignition tube into the flask carefully and make sure that the solution do not mix water each other.
4. Put a cork on the flask.
5. Weigh the flask with all the contents carefully. Let it be  $W_1$ .
6. Now tilt and swirl the flask such that the solution of barium chloride and sodium sulphate mix with each other.
7. Weigh the flask again. Let it be  $W_2$ .



1. A reaction takes place between barium chloride and sodium sulphate and the solution forms a white precipitate.
2. We observe that  $W_1 = W_2$ .

## Chemical Equation



## Explanation

When an aqueous solution of barium chloride is mixed with an aqueous of sodium sulphate, a white precipitate of barium sulphate is formed. An exchange of constituents has taken place between the reactants, i.e., ion has been exchanged by sulphate ion. As such no loss or gain in mass is expected. In other words, the mass remains conserved.

## RESULT

The law of conservation of mass is verified.

## PRECAUTIONS

1. Wash all the apparatus and clean them properly before use.
2. Prepare a 5% solution of  $\text{BaCl}_2$  and  $\text{Na}_2\text{SO}_4$  solution carefully.
3. Place the ignition tube containing aqueous solution of  $\text{Na}_2\text{SO}_4$  gently in the conical flask so that the two solutions do not get mixed.

## VIVA VOCE QUESTIONS

- Q1. Who stated the law of conservation of mass?  
Ans. Antoine L. Lavoisier.
- Q2. State the law of conservation of mass.  
Ans. "Mass can neither be created nor destroyed."
- Q3. What happens in the conical flask when we tilt and twist it?  
Ans. A white precipitate of  $\text{BaSO}_4$  is formed.
- Q4. Why should we put a cork on the mouth of the flask?  
Ans. So that the contents of the flask do not spill out.
- Q5. Does the mass of the flask and its content change?  
Ans. No, mass of the reactants and products is conserved.

## Multiple Choice Questions

1. In a chemical reaction, the sum of masses of the reactants and products remains unchanged. This is called  
(a) Law of constant proportion  
(b) Law of multiple proportion  
(c) Law of conservation of mass  
(d) None of these.
2. The law of conservation of mass states that  
(a) mass can either be created or destroyed  
(b) mass can be created but not destroyed  
(c) mass can be destroyed but not created  
(d) mass can neither be created nor destroyed
3. In the reaction, barium chloride reacts with sodium sulphate to form  
(a) white precipitate of sodium chloride  
(b) white precipitate of barium sulphate  
(c) yellow precipitate of sodium chloride  
(d) none of these.
4. In the reaction between barium chloride and sodium sulphate, mass of the reactants and the products  
(a) remain the same  
(b) remain unequal  
(c) are conserved  
(d) none of these.
5. During the reaction of barium chloride and sodium sulphate solutions,  
(a) exchange of ion of chloride and sulphate takes place  
(b) exchange of ion of chloride and sodium takes place  
(c) exchange of ion of sulphate and barium takes place  
(d) none of these.
6. The law of conservation of mass was stated by  
(a) Antoine L. Lavoisier  
(b) Democritus  
(c) W. Proust  
(d) Louis Pasteur.

## Answers

1. (c) 2. (b) 3. (b) 4. (c) 5. (a) 6. (a)