

# A.M TUTORIALS

## MAHARASHTRA BOARD CLASS 10 SCIENCE NOTES

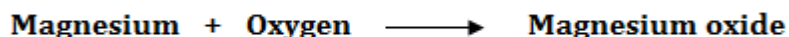
### (CHEMICAL REACTION AND EQUATIONS)

#### ➤ Chemical Reaction

- A chemical reaction is a process in which the initial substances change to form a new substance.
  - Chemical reactions involve chemical changes.
  - During chemical reactions, a rearrangement of atoms takes place between the reacting substances to form a new substance having entirely different properties.
  - A chemical reaction involves breaking of old chemical bonds existing between the atoms of reacting substances, and then making of new chemical bonds between the rearranged atoms of new substances.
  - During a chemical reaction, the atoms of one element do not change into those of another element.
- Only a rearrangement of atoms takes place in a chemical reaction.  
When a chemical change occurs, a chemical reaction takes place.

#### ➤ Chemical Equation

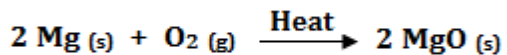
- The simple form of representation of a chemical reaction in words is known as a word equation.



(Reactants)

(Products)

- Representation of a chemical reaction with the help of chemical formulae is called a chemical equation.



(Reactants)

(Products)

#### ➤ Writing Chemical Equations

- In a chemical reaction, the reactants are written on the left hand side and the products on the right hand side of the equation.
- An arrow ( $\rightarrow$ ) pointing towards the products is inserted between the reactants and the products. It also represents the direction of the reaction.
- A single arrow ( $\rightarrow$ ) indicates the direction in which the reaction proceeds.

- A double arrow ( $\rightleftharpoons$ ) indicates a reversible reaction, i.e. the products recombine to form the reactants.
- A plus sign (+) is inserted between two or more reactants or products formed.
- If reactions are carried out under specific conditions of temperature, pressure, catalyst etc., then these conditions are mentioned on the arrow.
- The chemical equation can be made more informative by mentioning the physical states of the reactants and products.
- If a gas is liberated as a product, then it is represented by an arrow pointing upwards ( $\uparrow$ ). If the product formed is in the form of a precipitate, then it is represented by an arrow pointing downwards ( $\downarrow$ ).

## CHEMISTRY CHEMICAL REACTIONS AND EQUATIONS

### ➤ Balancing Chemical Equations

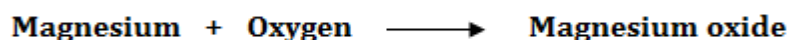
- In a balanced chemical equation, the total number of atoms of each element of the reactants on the left hand side of the equation is equal to the number of atoms of the products formed on the right hand side of the equation.
- The total mass of the reactants is equal to the total mass of the products or the number of atoms of each element before the reaction and after the reaction is equal.

#### ❖ Steps Involved in Balancing a Chemical Equation

Consider the chemical reaction between magnesium and oxygen to understand the steps involved in balancing a chemical equation.

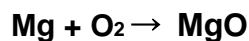
##### ❖ Step 1

Let us first write the word equation for this reaction.



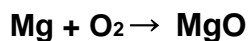
##### ❖ Step 2

Write the chemical equation for the reaction between magnesium and oxygen.



##### ❖ Step 3

Count the number atoms of an element occurring on both LHS and RHS in this equation.

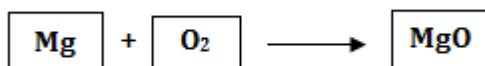


Component	Reactant	Product
Magnesium	1	1
Oxygen	2	1

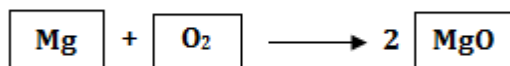
This is an unbalanced equation.

#### ❖ Step 4

- To balance a chemical equation, first draw boxes around each formula. Do not change anything inside the boxes while balancing the equation.



- Choose a reactant or a product which has the maximum number of atoms. In that compound, select the element which has the maximum number of atoms. In this equation, we shall select MgO, i.e. magnesium oxide and the element oxygen.
- To balance the oxygen atoms, let us multiply magnesium oxide molecule by 2 on the right hand side.



The equation can now be expressed as :-

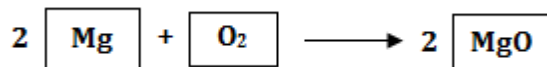
Component	Reactant	Product
Magnesium	1	1*2=2
Oxygen	2	1*2=2

#### ❖ Step 5

There are two oxygen atoms on either side of the equation, but one magnesium atom on the reactant side and two on the product side. So, multiply the magnesium atom by 2 on the left hand side.

Component	Reactant	Product
Magnesium	1*2=2	2
Oxygen	2	2

The balanced equation is

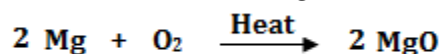


∴ Number of atoms of each element of reactants = Number of atoms of each element of products

### ❖ Step 6

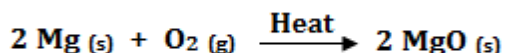
#### Writing Specific Conditions on the Arrow

The reaction is carried out in the presence of 'Heat'. On heating, magnesium combines with oxygen present in the air to form magnesium oxide.



### ❖ Step 7

#### Writing Symbols of Physical States



Using these steps, you can balance any chemical equation.

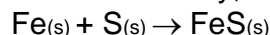
## ➤ Types of Chemical Reactions

### ➤ Combination Reaction

When two or more substances combine to form a single product, the reaction is known as a combination reaction.

#### For example:

In the laboratory, iron sulphide is prepared by mixing iron and sulphur.

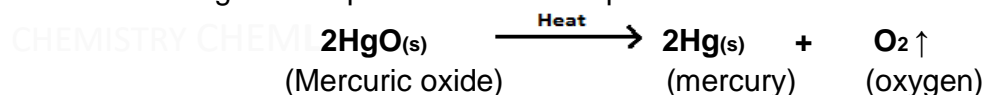


### ➤ Decomposition Reaction

A chemical reaction in which a single compound splits into two or more simple substances is called a decomposition reaction.

#### For example:

When mercuric oxide is heated in a crucible, the orange-red powder begins to darken and a silver mirror begins to deposit on the cooler parts of the crucible.



• **Thermal Decomposition Reaction:** Decomposition reactions carried out by heating are known as thermal decomposition reactions.

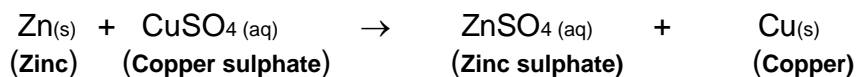
• **Photochemical reaction:** Chemical reactions which proceed with the absorption of light energy are called photochemical reactions.

### ➤ Displacement Reaction

Reactions in which the more reactive element displaces the less reactive element from its compound are called displacement reactions.

**For example:**

Zinc displaces copper in copper sulphate to form zinc sulphate.

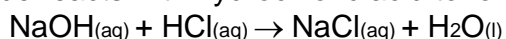


### ➤ Double Displacement Reaction

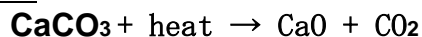
Reactions in which ions of the reactants exchange places to form two new compounds are called double displacement reactions. **Double displacement** reaction is also known as **precipitation reaction** if some insoluble substance formed during reaction.

**For example:**

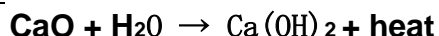
Sodium hydroxide reacts with hydrochloric acid to form sodium chloride and water.



• **Endothermic Reaction**: Reactions accompanied by the absorption of heat are called endothermic reactions.



• **Exothermic Reaction**: Reactions accompanied by the evolution of heat are called exothermic reactions.

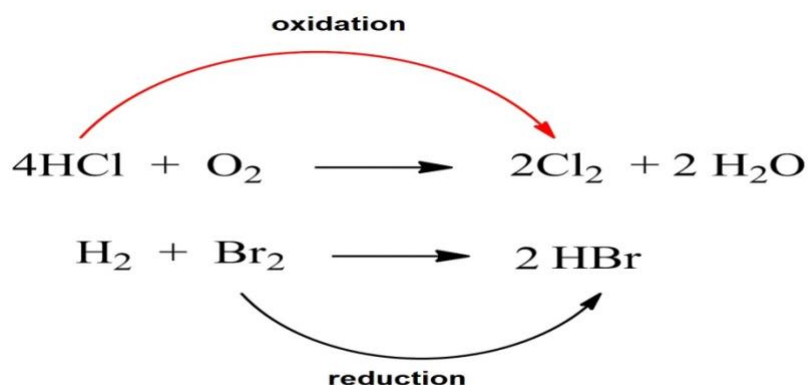


### ➤ Oxidation Reactions

Reactions which involve the addition of oxygen or the removal of hydrogen are called oxidation reactions.

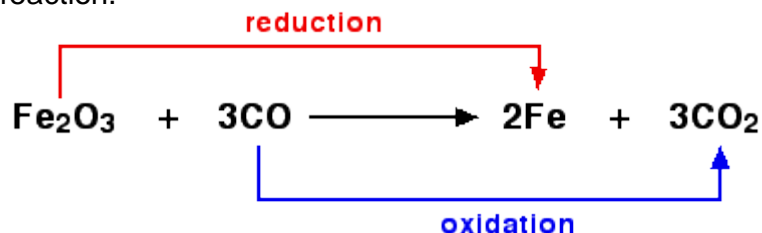
### ➤ Reduction Reactions

Chemical reactions in which the reactants gain hydrogen are reduction reactions.



## Redox Reaction

The chemical reaction in which oxidation and reduction take place simultaneously is known as a redox reaction.



## ➤ Differences between Oxidation and Reduction

### REDOX REACTIONS

<u>oxidation</u>	<u>reduction</u>
1. Addition of oxygen	1. Removal of oxygen
2. Removal of hydrogen	2. Addition of hydrogen
3. Addition of an electronegative element	3. Removal of an electronegative element
4. Removal of an electropositive element	4. Addition of an electropositive element
5. Loss of electron	5. Gain of electron

## ➤ Corrosion

The slow process of decay and destruction of metals due to the action of air, moisture or acids is called corrosion.

**For example:**

Iron combines with oxygen present in the air and in the presence of moisture (water) to form a red-brown flaky substance called rust. This process is commonly called the **rusting of iron**.

The chemical formula of rust is  $(\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O})$ , where 'x' represents **number of molecules of water**.

## ➤ Prevention of Corrosion

- Corrosion damages buildings, bridges, ships, automobiles and articles made of iron. Hence, prevention of corrosion is necessary. This will not only save money but can also prevent the occurrence of accidents.

- Corrosion can be prevented by processes like galvanising and electroplating with other metals.

**NOTE:-1) Galvanization or galvanizing is the process of applying a protective zinc coating to steel or iron, to prevent rusting.**

**2) Electroplating is a process that uses an electric current to reduce dissolved metal cations so that they form a thin coherent metal coating on an electrode.**

### ➤ **Rancidity**

- Oils and fats react with oxygen and get oxidised or turn rancid. This process is called rancidity.
- Rancidity can be prevented by keeping food in air tight containers or by using antioxidants.
- Antioxidants are used to prevent oxidation of food containing fats and oils.
- Storage of food in air tight containers also decelerates oxidation.