

## Chemical reactions and equations

Chemical reactions are the processes in which new substances with new properties are formed.



Reactants      product

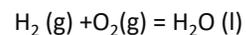
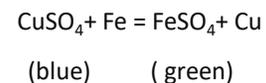
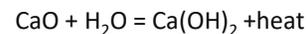
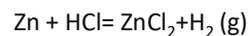
- The substances which take part in a chemical reaction are called reactants.
- The substance produced in a chemical reaction are called products.

### Characteristics of chemical reactions

- Evolution of a gas
- Formation of a precipitate
- change in temperature
- Change in colour
- Change in state

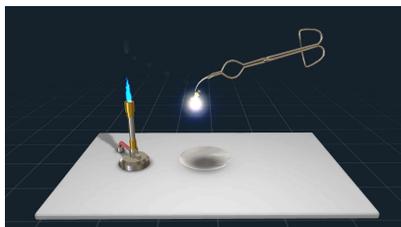
#### important points

MgO white powder  
 Pb(NO<sub>3</sub>)<sub>2</sub> yellow precipitate  
 CaCO<sub>3</sub> white precipitate  
 Fe<sub>2</sub>O<sub>3</sub> brown colour  
 FeSO<sub>4</sub> green  
 PbO yellow precipitate

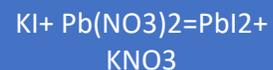


## Examples of chemical reactions and equations

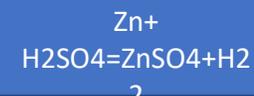
- Mg is reacting with oxygen to produce MgO.
  - We observe a white bright flame while burning.
  - When we dissolve the white MgO powder in water it forms Mg(OH)<sub>2</sub>.
  - It is basic in nature as it turns blue litmus solution into red.
    - $\text{Mg} + \text{O}_2 = \text{MgO}$
  - $\text{MgO} + \text{H}_2\text{O} = \text{Mg(OH)}_2$



Potassium iodide is reacting with lead nitrate to form a yellow precipitate of lead iodide.



Zinc is reacting with sulphuric acid to produce hydrogen and zinc sulphate salt.



## Law of conservation of mass and balancing of equations

### Chemical equations

The method of representing a chemical reaction with the help of symbols and formulas of the substances involved in it known as a chemical equation.

Chemical equations are of two types.

1. Balanced chemical equation= a balanced chemical equation has an equal number of atoms of different elements in the reactants and products.



2. Unbalanced chemical equation= an unbalanced chemical equation has an unequal number of atoms of one or more elements in the reactants and products.

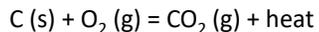


**We balance equation to prove law of conservation of mass i.e matter neither be created nor be destroyed.**

Balancing equation= The process of making the number of different types of atoms equal on both the sides of an equation is called balancing of equation.

### How to make equations more informative

• By indicating the physical states of reactants and products solid(s), liquid (l), gas(g), aqueous (aq)



• By indicating the conditions under which the reaction takes place



Two ways of balancing equations  
1. Hit and trial method  
2. Partial balancing method

Chemical equations are of two types  
Word equations  
Symbol equations

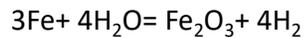
To make equations more informative and more important equations

In the chemical reaction there is a change in temperature

**They are of two types** 1. exothermic= when heat is evolved in the reaction.  $C+O_2=CO_2 + \text{heat}$

2. endothermic= when heat is absorbed in the reaction.  $CaCO_3 \xrightarrow{\text{heat}} CaO + CO_2$

1. Iron is reacting with water



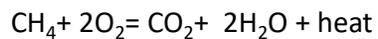
2. Carbon mono oxide is reacting with hydrogen



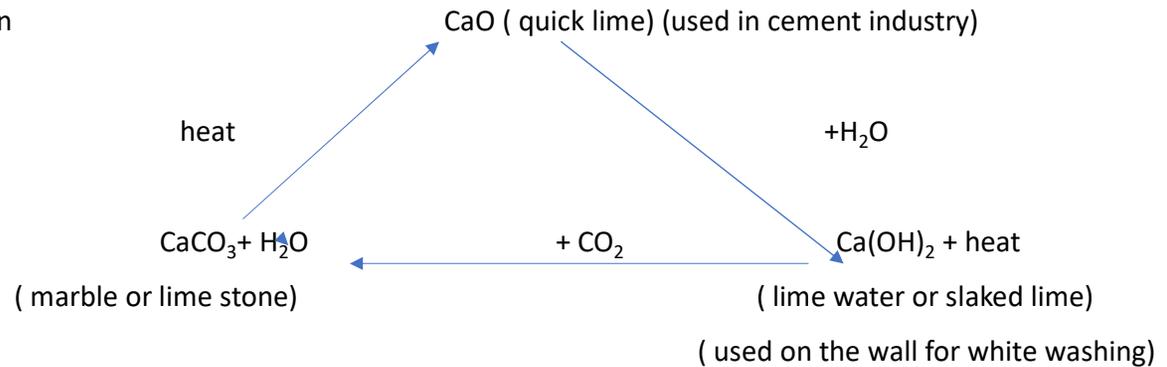
3. Coal is burning



4. Burning of natural gas



5. Respiration



## Types of chemical reactions

### 1. Combination reaction

Those reactions in which two or more substances combine to form a single substance, are called combination reactions



### 2. Decomposition reaction

Those reactions in which a compound splits up into two more simpler substances are known as decomposition reactions



It is of three types

#### 1. Thermal decomposition



#### 2. Electrolytic decomposition



( acidulated )

#### 3. Light decomposition



FeSO<sub>4</sub>. 7H<sub>2</sub>O green vitriol

CuSO<sub>4</sub>. 5H<sub>2</sub>O blue vitriol

SO<sub>2</sub> has pungent smell

NO<sub>2</sub> has brown fumes

Hydrogen is collected at the cathode and oxygen is collected at the anode

The volume of hydrogen is double than oxygen

AgCl or AgBr is used in black and white photography

Displacement reaction depends on reactivity series

BaSO<sub>4</sub> forms curdy white precipitate

## Types of chemical reaction

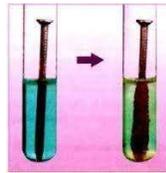
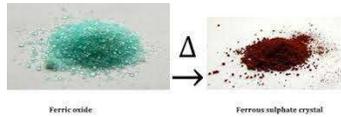
### 3. Displacement reaction

- Those reactions in which one element takes place of another element in a compound, are known as displacement reaction.



### 4. Double displacement reaction

- Those reaction in which two compounds react by an exchange of ions to form two new compounds are called double displacement reaction.



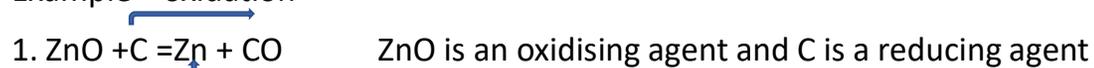
Fe is reacting with  $\text{CuSO}_4$  and due to single displacement reaction green colour  $\text{FeSO}_4$  is formed and brown colour deposition is formed on the iron nail



## Oxidation and reduction

- **Oxidation:** the addition of oxygen to a substance or removal of hydrogen from a compound is called oxidation
- **Reduction:** the addition of hydrogen and removal of oxygen from a compound is called reduction.
- **Oxidising agent:** the substance oxidises others and reduce itself is called oxidising agent.
- **Reducing agent:** the substance reduces others and oxidises itself is called reducing agent

Example oxidation

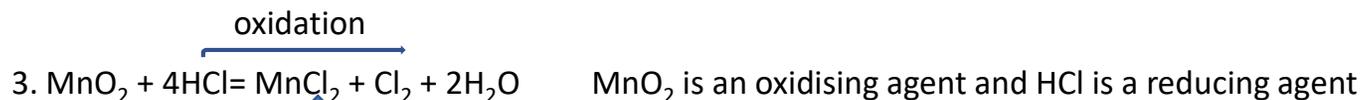


reduction

reduction



Oxidation



reduction

oxidation and reduction  
reaction is known as  
redox

In every reaction there is  
oxidation and reduction.  
Oxidation and reduction is  
inseparable

Oxidation is loss of electrons  
Reduction is gain of electrons

Cu on heating with oxygen turns into black copper oxide, when we pass hydrogen on the heated copper oxide we will get back reddish brown Cu.  
 $\text{Cu} + \text{O}_2 = \text{CuO}$   
 $\text{CuO} + \text{H}_2 = \text{Cu} + \text{H}_2\text{O}$

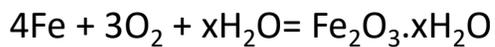
## Corrosion and rancidity

- **Corrosion**= it is a process in which the surface of a metal is reacting with air, water and other substances is called corrosion.
- **Rancidity**= the condition produced by aerial oxidation of fats and oils in foods marked by unpleasant smell and taste is called rancidity.

rancidity can be prevented by

- Adding anti oxidant
- By packing fat and oil containing food in nitrogen gas
- Can be prevented by refrigerator
- Can be prevented by air tight container
- Keep away from the sunlight

Equation of rusting



rusting can be prevented by

1. painting
2. oiling or greasing
3. galvanizing
4. making alloy

