CH- 1, CHEMICAL REACTIONS AND EQUATIONS

CLASS NOTES

WHAT is Chemical Reaction?

- The transformation of chemical substance into another chemical substance is known as Chemical Reaction.

Characteristics of Chemical Reactions

1. Evolution of gas
2. Change in Colour
3. Change in state of substance
4. Change in temperature

In a chemical reaction, a new substance is formed which is completely different in properties from the original substance, so in a chemical reaction, a chemical change takes place.

In a chemical reaction....

- **The substances which take part in a chemical reaction are called reactants.**
- **The new substances produced as a result of a chemical reaction are called products.**

CHEMICAL EQUATIONS

- **Reactants- Magnesium + Oxygen**
- **Product- Magnesium oxide.**
- **Magnesium + Oxygen ➡ Magnesium oxide**

Writing a CHEMICAL EQUATIONS

- **Magnesium + Oxygen → Magnesium oxide**
  - **$Mg + O_2 \rightarrow MgO$**
- **Sodium + Chlorine → Sodium chloride**
  - **$Na + Cl \rightarrow NaCl$**
- **Iron + Water → Ferrous oxide + Hydro^n**
  - **$Fe + H_2O \rightarrow Fe_3O4 + H_2$**
- **Calcium carbonate → Calcium oxide + Carbon dioxide**
  - **$CaCO_3 \rightarrow CaO + CO_2$**

Balancing Chemical Equations

Hit-n- Trial Method

- $Mg + O_2 \rightarrow MgO$
- Step 1- first draw boxes around each formula. Do not change anything inside the boxes while balancing the equation.
  - Mg + O2 → MgO
- Step 2- List the number of atoms of different elements present in the unbalanced equation.
  - Mg + O2 → MgO

Name of atom	reactant
Mg	1
O	2

- Step 3- Use Hit & Trial method to balance the equation.
  - 2 Mg + O2 → 2MgO

Name of atom	reactant
Mg	1 X 2 =2
O	2

ABCD Method

$3BaCl_2 + 1Al_2(SO_4)_3 \rightarrow 3BaSO_4 + 2AlCl_3$

- Ba- 1a = 1c
- Cl – 2a = 3d
- Al – 2b = 1d
- S- 3b = 1c
- O – 12b = 4c
- LET b = 1
- 3 X 1= c,= a=3
- 12 = 4 X c = c= 3
- 2 X 1 = d

Types of chemical reactions

Combination reaction

- Such a reaction in which a single product is formed from two or more reactants is known as a combination reaction.

- CaO + H2O → Ca(OH)2
- Na(s) + O2(g) → Na2O
- $2Co_2 + O_2 \rightarrow 2Co_3$

- A+B → AB

Exothermic chemical reactions

- heat is evolved during a reaction. Most of the combination reactions are exothermic.
- $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
- Resperation reaction is also an ER
- $Al + Fe_2O_3 \rightarrow Al_2O_3 + Fe + heat$
- $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + heat$

Decomposition Reaction

- A single reactant decomposes on the application of heat or light or electricity to give two or more products.
- $CaCO_3 \rightarrow CaO + CO_2$
- Calcium Carbonate Quick Lime
- When silver chloride turns grey in sunlight. This is due to the decomposition of silver chloride into silver and chlorine by light.
- $2AgCl(s) \xrightarrow{Sunlight} 2Ag(s) + Cl_2(g)$
- AB → A+B

Endothermic reactions

- Reactions in which energy is absorbed are known as endothermic reactions..
- $2AgBr(s) \xrightarrow{Sunlight} 2Ag(s) + Br_2(g)$

Displacement reaction

- ❑ More reactive element displaces a less reactive element from its compound or solution.

➢ $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

Iron Copper Sulphate Ferrous Sulphate Copper

➢ $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

Double displacement reaction or Precipitation reaction

- ❑ Such reactions in which there is an exchange of ions between the reactants are called double displacement reactions.

➢ $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(Sodium Sulphate) (Barium Chloride) (Barium Sulphate)

➢ This insoluble substance formed is known as a precipitate. Any reaction that produces a precipitate can be called a precipitation reaction.

Redox reaction (Oxidation & Reduction)

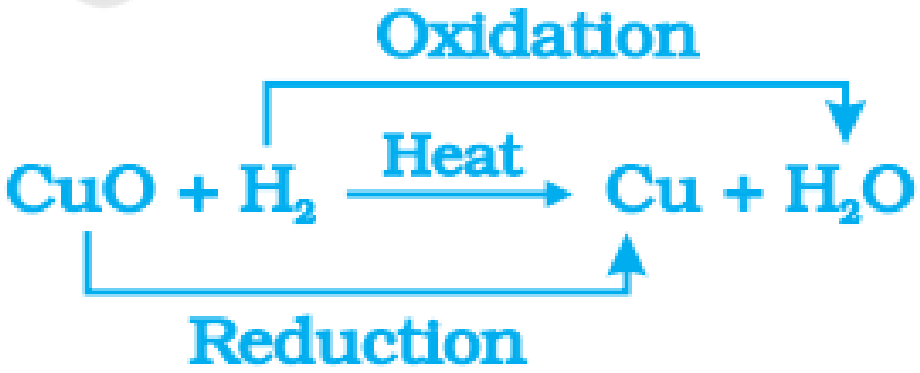
Situation 1

➢ If a substance gains oxygen during a reaction, it is said to be oxidized

➢ If a substance loses oxygen during a reaction, it is said to be reduced.

➢ $2Cu + O_2 \rightarrow 2CuO$

- **CuO +H2 → Cu+ H2O**
  - **CuO redused to Cu & H2 Oxidised to H2O**
  - **So, Cu is Oxidising Agent & H2 is redusing agent**
- **MnO+ 4HCl → 2MnCl + 2H2O + Cl2**



Situation 2

- **loses hydrogen during a reaction, it is oxidized.**
- **gains hydrogen during a reaction, it is reduced.**
- **MnO+ 4HCl → 2MnCl + 2H2O + Cl2**
- **NH3 + CuO → Cu + N2 + H2O**
- **Fe + H2O → Fe3O4 + H2**
- **Zn + CuSO4 → ZnSO4 + Cu**

Situation 3

- **Substance loses electrons in Oxidation reaction.**
- **Substance gains electrons, it is reduced.**

$Zn_{(s)} + CuSO_{4\,(aq)} \rightarrow ZnSO_{4\,(aq)} + Cu_{(s)}$

Oxidation: $Zn \rightarrow Zn^{2+} + 2e^-$

Reduction: $Cu^{2+} + 2e^- \rightarrow Cu$

Oxidation (with respect to A)	Reduction (with respect to A)
Oxidation is the loss of electrons or hydrogen atoms or gain of oxygen atoms.	Reduction is the gain of electrons or hydrogen atoms or loss of oxygen atoms.
Removal or loss of electrons $A \rightarrow A^{+}+e^{-}$	Addition or gain of electrons $A+e^{-} \rightarrow A^{-}$
Removal of Hydrogen AH+B -> A+BH	Addition of Hydrogen A+BH ->AH+B
Addition of oxygen A+BO -> AO+B	Removal of oxygen AO+B -> A+BO
All the above reactions releases energy	All the above reactions stores energy

EFFECTS OF OXIDATION REACTIONS IN EVERYDAY LIFE?

Corrosion

- **When a metal is attacked by substances around it such as moisture, acids, etc., it is said to corrode and this process is called corrosion.**
- **The black coating on silver and the green coating on copper are other examples of corrosion**

❑ **Effects- Corrosion causes damage to**

- **Car bodies.**

- **Bridges**
- **iron railings**
- **ships**

Rancidity.

What is rancidity?

- Rancidity is the development of unpleasant smells in fats and oils, which are often accompanied by changes in their texture and appearance.