

CHEMISTRY CLASS X

Module -4/4

Chapter- 1

Chemical Reactions and Equations

A K Sindhu

PGT (SS) Chemistry

AECS-Kudankulam

OUTLINE

- Oxidation Reaction
- Reduction Reaction
- Redox Reaction



Redox Reactions in Day to Day life

- Redox reactions are reactions in which one species is reduced and another is oxidized.
- These reactions are important for a number of applications, including energy storage devices (batteries), photographic processing, and energy production and utilization in living systems including humans.
- we look closely, we might observe hundreds of chemical reactions taking place in our vicinity. Like-
- Respiration
- Combustion
- Photosynthesis
- Corrosion
- Breath Analyzers
- Medicine like Action of H_2O_2 as antiseptic
- Decomposition of dead and decayed organisms
- Photography etc

- Cops often use breathalyzers or breath analyzers to estimate the content of alcohol in a driver's breath. Even the breathalyzers employ the chemical principle of redox reactions. Once a driver breathes into the breathalyzers, an acidic solution of potassium dichromate reacts with it. What happens is that the ethanol in the breath is oxidised to acetic acid; whereas the chromium (VI) in the orange-yellow dichromate ion is reduced to chromium(III) which is green in colour. The amount of colour change corresponds to levels of alcohol in the blood.



Redox Reactions in Day to Day life



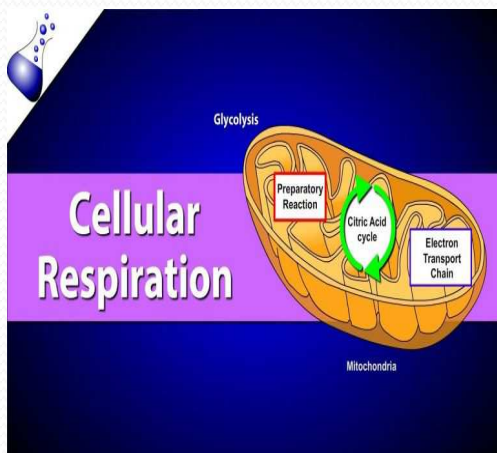
Combustion



Medicine



Rusting



Cellular respiration



Decomposition



Bleaching action

OXIDATION

- **Addition of oxygen is oxidation.**



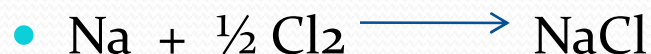
Carbon is getting oxidised to carbon dioxide

- **Removal Of hydrogen is oxidation**



HCl is getting oxidised to Cl_2 by removal of hydrogen.

- **Addition of electronegative substance is oxidation.**



Sodium is getting oxidised by combining with electronegative chlorine molecule



Mercury (II) is oxidised to Oxygen(**Removal of electropositive element**)

- **Loss of electron is oxidation**



REDUCTION

- **Addition of hydrogen is reduction**



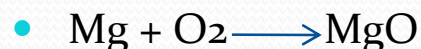
Cl_2 is undergoing reduction by combining with hydrogen to HCl

- **Removal of oxygen is reduction**



H_2O is getting reduced to H_2 by the removal of oxygen.

- **Addition of electropositive element is reduction.**



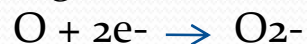
O_2 is undergoing reduction by combining with electropositive magnesium to MgO

- **Removal of electronegative element is reduction.**



HgO is undergoing reduction to Hg by the removal of electronegative oxygen atom.

- **Gain of electron is reduction.**

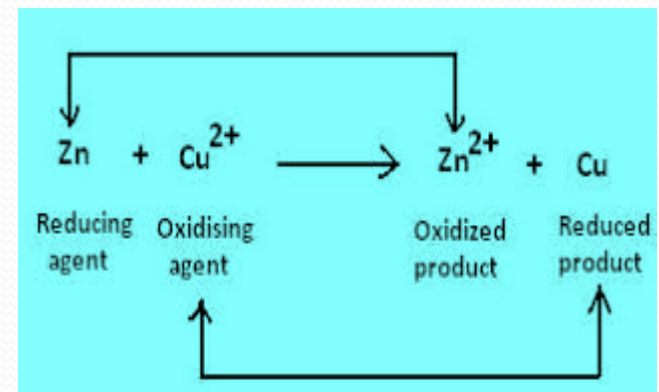
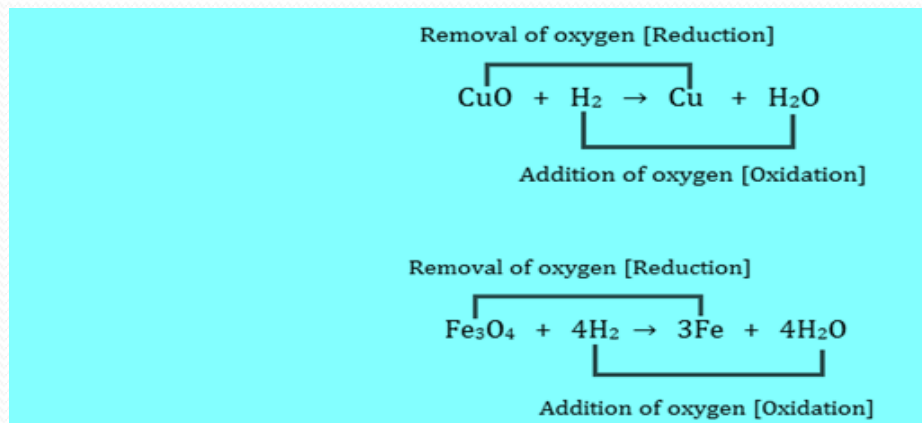


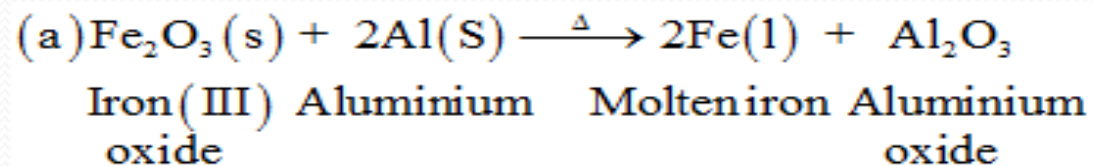
Redox Reaction

- A chemical reaction in which oxidation and reduction reaction takes place simultaneously is known as redox reaction.
- Characteristics of redox reaction-
- Oxidation reduction reaction takes place simultaneously
- An oxygen rich compound is reduced and the oxygen produced is use to oxidise the other reactant.
- Reactant which loses oxygen is oxidising agent (oxidant) and reactant which gains oxygen is reducing agent(reductant)

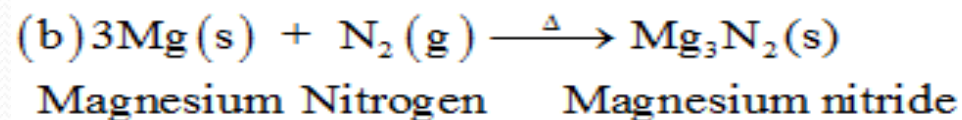
Examples -Redox Reactions

- $$\text{Zn} + \text{CuSO}_4 \longrightarrow \text{ZnSO}_4 + \text{Cu}$$
- $$\text{Fe}_{(s)} + \text{CuSO}_{4(aq)} \longrightarrow \text{FeSO}_{4(aq)} + \text{Cu}_{(s)}$$
- $$\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$$
- In the above reaction carbon is oxidised to CO and ZnO is reduced to Zn.
- $$\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$$
- In the above reaction HCl is oxidised to Cl₂ whereas MnO₂ is reduced to MnCl₂.

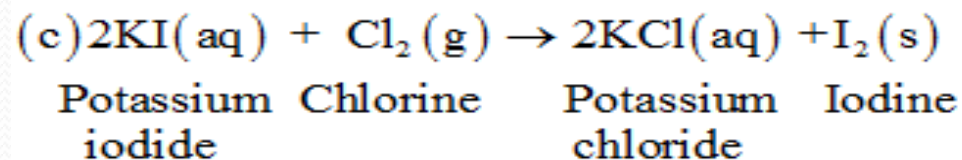




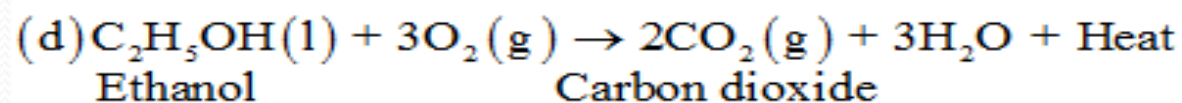
This is an example of displacement and Redox reaction.



This is an example of combination reaction.



This is an example of Redox and displacement reaction.

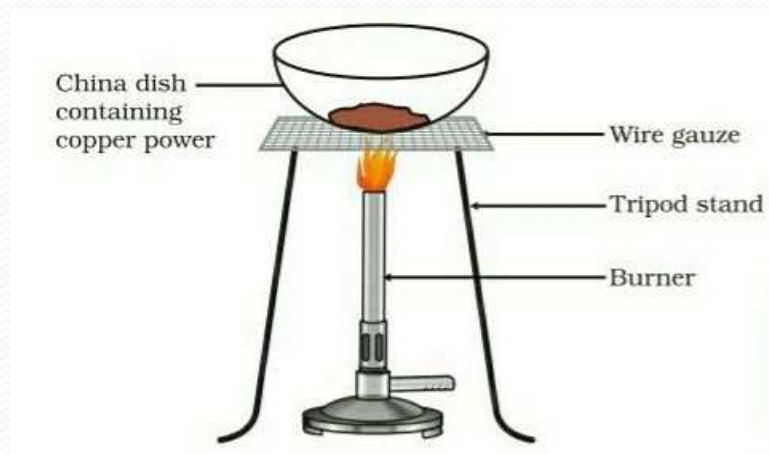


This is an example of combustion reaction.

Double displacement reactions are not redox reactions

Activity 1.11 NCERT TEXT

- **Experiment-** Heat a china dish containing about 1g copper powder.
- **Observation-** The surface of copper powder becomes coated with black copper(II) oxide.
- **Inference-** This is because oxygen is added to copper and copper oxide is formed.
- $2\text{Cu} + \text{O}_2 \xrightarrow{\Delta} 2\text{CuO}$
- If hydrogen gas is passed over this heated material (CuO), the black coating on the surface turns brown as the reverse reaction takes place and copper is obtained.
- $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$



- **Oxidant-** Substance which helps in oxidation is known as oxidant or oxidising agent. Itself it undergoes reduction.
- **Reductant-** Substance which helps in reduction is known as reductant or reducing agent. Itself it undergoes oxidation.
- $$\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$$

Oxidant Reductant
- HCl is undergoing oxidation to Cl₂ ,therefore HCl is reductant.
- MnO₂ is undergoing reduction to form MnCl₂ ,therefore MnO₂is oxidant.
- $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$ (Mg is reductant, O₂ oxidant)
- $\text{C} + \text{O}_2 \longrightarrow \text{CO}_2$ (C is reductant, O₂ oxidant)
- $\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$ (ZnO is Oxidant, C is reductant)

Summary

Redox Reaction

Oxidation

(Addition of oxygen, Removal of hydrogen, addition of electronegative element, loss of electron)

Reduction

(Addition of hydrogen, Removal of oxygen, addition of electropositive element, gain of electron)

THANK YOU

