# REDOX REACTIONS

## CLASSICAL IDEA OF REDOX REACTIONS & OXIDATION AND REDUCTION REACTIONS

### 1. CLASSICAL CONCEPT OF OXIDATION REDUCTION

**A. Oxidation:** According to this concept, oxidation is considered as the addition of oxygen or removal of hydrogen in an ion, in a compound or in a species. Or the addition of an electronegative element or removal of electropositive element, in an ion, in a species or in a compound is called oxidation.

For example:

(a) $2Mg + O_2 \rightarrow 2MgO$ $\rightarrow$ Addition of Oxygen.

(b) $C + O_2 \rightarrow CO_2$

(c) $H_2S + Cl_2 \rightarrow 2HCl + S \rightarrow$ Removal of Hydrogen

(d) $MnO_2 + 4\underline{HCl} \rightarrow MnCl_2 + Cl_2 + 2H_2O$

**B. Reduction:** According to this concept, reduction is considered as addition of hydrogen or removal of oxygen atom, in an ion, in a species or in a compound. Or addition of an electropositive element or removal of an electronegative element, in an ion, in a species or in a compound is called reduction.

For example:

(a) $H_2S + \underline{Cl_2} \rightarrow 2HCl + S$

$\rightarrow$ Addition of Hydrogen

(b) $H_2 + \underline{Cl_2} \rightarrow 2HCl$

(C) $\underline{ZnO} + C \rightarrow Zn + CO$

$\rightarrow$ Removal of Oxygen

(d) $FE_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

### 2. OXIDATION NUMBER CONCEPT OF OXIDATION-REDUCTION

**A. Oxidation:** According to this concept, increase in oxidation no. in an element in a reaction is called oxidation.

B. **Reduction:** According to this concept, decrease in oxidation no. in an element in a reaction is called reduction.

For example:

$$\underset{+7}{KMnO_4} + \underset{+2}{FeSO_4} \rightarrow \underset{+2}{MnO} + \underset{+3}{Fe_2(SO_4)_3}$$

◆ **OXIDANT OR OXIDISING AGENT**

Species, which oxidize other species, which is present in a reaction and reduce it self. This type of species is called oxidant or oxidising agent. Or species, which accepts electron in a reaction by another species and show decreases in its oxidation no. in the reaction is called oxidant or oxidising agent.

◆ **Some Important oxidising agent or oxidant**

1. All elements with high electronegative character like N, O, F, Cl, etc.
2. All metallic oxides like $Li_2O$, $Na_2O$, $Na_2O_2$, CaO, MgO, $BaO_2$ etc.
3. Some nonmetallic oxides like $CO_2$, $SO_2$, $H_2O_2$, $O_3$.
4. All neutral compound or ion in which element shows their higher oxidation no. or state are act as oxidant or oxidising agent like $KMnO_4$, $H_2SO_4$, $SnCl_4$, $H_3PO_4$, $K_2Cr_2O_7$, $HClO_4$, $CuCl_2$, $HNO_3$, $H_2SO_5$, $FeCl_3$, $HgCl_2$, etc.

**Reductant OR Reducing agent**

Species which reduce other element in a reaction and oxidize itself to donate electrons and show increase in its oxidation no. is called reductant or reducing agent.

**Some Important reducing agent or reductant**

1. All metals like, K, Mg, Ca, etc.
2. All metallic hydrides like NaH, $CaH_2$, $LiAlH_4$, $NaBH_4$, $AlH_3$, etc.
3. All hydracids like HF, HCl, HBr, $H_2S$ etc.
4. Some organic compounds like Aldehyde, formic acid, oxalic acid, tartaric acid.
5. All neutral compounds or ions, which show their lower oxidation state.

   MnO, HClO, $HClO_2$, $H_3PO_2$, $HNO_2$, $H_2SO_3$, $FeCl_2$, $SnCl_2$, $Hg_2Cl_2$, $CH_2Cl_2$ etc.

Some Important compound which can act as oxidant and reductant both

$HNO_2$, $SO_2$, $H_2O_2$, $O_3$, $Al_2O_3$, $CrO_2$, $MnO_2$, ZnO, CuO,

**NOTE:** $Al_2O_3$, $CrO_2$, $MnO_2$, ZnO, CuO are called as amphoteric oxide.