REDOX REACTIONS

OXIDATION NUMBER

RULES TO ASSIGN OXIDATION NUMBER

1) Oxidation number of an element in free elemental state or Uncombined state zera
2) In polyatomic ion, the algebraic sum of all the oxidation numbers of atoms of the ion must equal the charge on the ion
3) The oxidation number of oxygen in most of the compounds is -2
   In peroxides -1
   In superoxides —1/2
   In O_2F_2 +1
   In OF_2 +2
4) Oxidation number of hydrogen is +1 in most of its compounds(In metal hydrides -1)
5) Oxidation number of fluorine is always -1 in its compounds
6) Alkali metals have oxidation number +1 and alkaline earth metals have oxidation number +2 always in its compounds
7) The algebraic sum of the oxidation number of all the atoms in a compound must be zero.

$\overset{+1}{K}\overset{x}{Mn}\overset{-2}{O_4}$ $\quad 1 + x + 4x(-2) = 0 \implies x = +7$

OXIDISING AGENT (OXIDANTS): A reagent which can increase the oxidation number.
REDUCING AGENT (REDUCTANTS): A reagent which can decrease the oxidation number.

OXIDATION: Increase in the oxidation number

REDUCTION: Decrease in the oxidation number

REDOX REACTIONS: Reactions which involve change in oxidation number of the interacting species

PHYSICS WALLAH

BALANCING OF REDOX REACTION

1) Identify oxidation and reduction
2) Make total increase and total decrease in O.N equal
3) Balance atoms except O & H
4)

ACIDIC	BASIC
Balance - Oxygen with H_2O - Hydrogen with H^+	Balance - Charge with OH^- - Oxygen with H_2O

REDOX REACTION

TYPES OF REDOX REACTIONS

COMBINATION REACTION

A redox reaction in the form
A+B→C

Either A and B or both A and B must be in the elemental form for such a reaction to be a redox reaction.

eg: $H_2 + Cl_2 \rightarrow 2HCl$

DECOMPOSITION REACTION

Reaction leads to the breakdown of a compound into two or more components at least one of which must be in the elemental state.

eg: $H_2O \rightarrow H_2 + O_2$

DISPLACEMENT REACTION

An ion (or an atom) in a compound is replaced by an ion (or an atom) of another element.

$X + YZ \rightarrow XZ + Y$

METAL DISPLACEMENT

A metal in a compound can be displaced by another metal in the uncombined state.

eg: $CuSO_4 + Zn \rightarrow Cu + ZnSO_4$

NON-METAL DISPLACEMENT

Non-metal in a compound can be displaced by a metal or a non-metal

eg: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
$Na + H_2O \rightarrow NaOH + H_2$

DISPROPORTIONATION REACTIONS

In a disproportionation reaction an element in one oxidation state is simultaneously oxidised and reduced.

It always contains an element that can exist in at least three oxidation states.

eg: $2H_2O_2 \rightarrow 2H_2O + O_2$

Comproportionation reaction:

A reaction in which an element in a higher oxidation state reacts with the same element in a lower oxidation state to give the element in an intermediate oxidation state

eg: $Pb + PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$

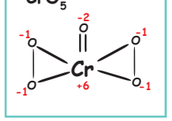
POINTS TO REMEMBER

Carbon suboxide

Fe_3O_4 $\quad \overset{+2}{Fe}O.\ \overset{+3}{Fe_2}O_3$

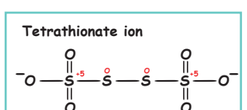
$CaOCl_2$ $\quad Ca(\overset{+1}{O}\overset{-1}{Cl})Cl$

CrO_5



Tribromooctaoxide

Tetrathionate ion



Highest O.S— Undergoes Reduction—Oxidising agent
Lowest O.S — Undergoes Oxidation—Reducing agent
Intermediate O.S — Oxidation & Reduction
—Oxidising Agent & Reducing Agent