

Redox Reactions

Oxidation → It is defined as electronegative or removal of oxygen substance / a substance from hydrogen / a substance.

For eg ->



Reduction → It is defined as the removal of oxygen / electronegative element from a substance or addition of hydrogen / electropositive element to a substance.

For eg ->



Redox Reactions → The reaction that involve oxidation & reduction as its two half reactions are called Redox reaction.

For eg ->



Reduction

→ Gain of Hydrogen

→ Loss of Oxygen

→ ~~Loss~~ ^{Loss} of any electronegative atom

→ ~~Gain~~ ^{Gain} of any electropositive atom.

→ It is gain of electrons

Oxidation

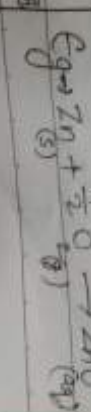
→ Loss of Hydrogen

→ Gain of Oxygen

→ ~~Loss~~ ^{Loss} of any electronegative atom

→ ~~Gain~~ ^{Gain} of any electropositive atom

→ It is loss of electrons



Oxidation Number or Oxidation state

Change occurs by any atom in the process of oxidation in the free state is called as Oxidation state in simple

Example	Oxidation number
Na	0
Na^+	+1
O	0
O^{2-}	-2
H	0
H^+	+1
H^-	-1
S	-2
S^{2-}	-2
O^{2-}	0
O^{+2}	-2
O^{+3}	+3
O^{+4}	-2
O^{+6}	0
O^{+7}	-1
S^{+6}	+2
S^{+4}	0

Important points of oxidation state

- Oxidation number of group-1 metals is +1.
- Oxidation number of group-2 metals is +2.
- Oxidation number of halogens is -1.
- Oxidation number of inert gases is 0.
- Oxidation number is of all molecules is 0.

* Calculation of Oxidation number

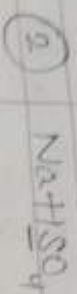


$$\Rightarrow 1 + 2 + n - 8 = 0$$

$$\Rightarrow -5 + n = 0$$

$$\Rightarrow n = +5$$

So, Oxidation number of P is +5



$$\Rightarrow 1 + 1 + x - 8 = 0$$

$$\Rightarrow -6 + x = 0$$

$$\Rightarrow x = +6$$

So, oxidation number of 'S' is +6



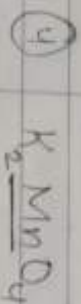
$$\Rightarrow 4 + 2x - 14 = 0$$

$$\Rightarrow -10 + 2x = 0$$

$$\Rightarrow 2x = +10$$

$$\Rightarrow x = +5$$

So, oxidation state of 'P' is +5

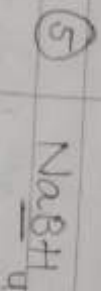


$$\Rightarrow 2 + x - 8 = 0$$

$$\Rightarrow x - 6 = 0$$

$$\Rightarrow x = +6$$

So, oxidation state of Mn is +6



$$\Rightarrow 1 + x + 4 = 0$$

$$\Rightarrow x + 5 = 0$$

$$\Rightarrow x = -5$$

So, oxidation state of 'B' is -5

Types of Redox Reactions \rightarrow

① Combination Reaction \rightarrow A

combination reaction may be denoted in the manner:



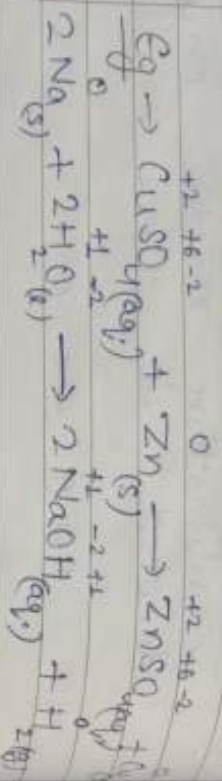
Either A or B or both A & B is must of elemental form to be a redox reaction



② Decomposition Reaction \rightarrow Decomposition reactions are the opposite of combination reactions. It leads to the breakdown of compound in two or more components.



③ Displacement reaction \rightarrow In a displacement reaction, an ion (or an atom) in a compound is replaced by an ion (or an atom) \checkmark . It may be denoted as:



④ Disproportionation reaction \rightarrow Such reactions in which same object is oxidized & reduced both simultaneously is called Disproportionation reaction.



Balancing of Redox Reactions:

There are two methods of balancing the chemical equations

① Oxidation number method (for all type of reaction.)

② Ion-electron method. (only for ionic reactions) for

★ Oxidation Number Method \Rightarrow

Following are main steps \rightarrow

① Write down the oxidation no. of all the elements present in given reaction per atom

② Identify whose oxidation no. is changing & break the given reaction in two half reactions
 - Oxidation half reaction (OHR) & Reduction half reaction.

③ Balance the atom whose oxidation no. is changing.

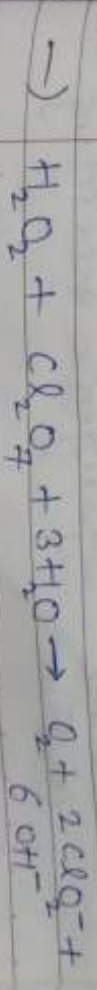
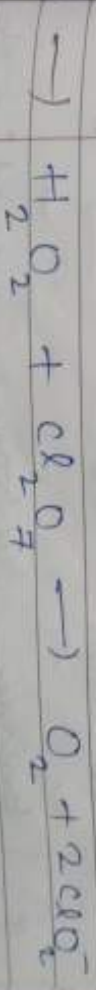
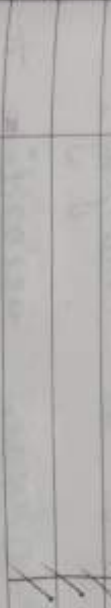
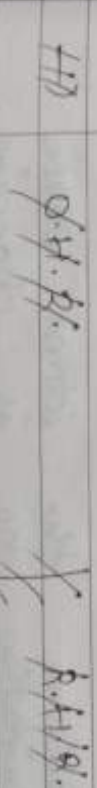
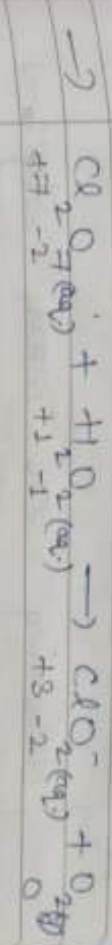
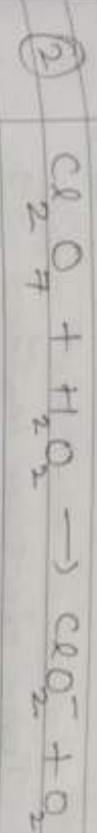
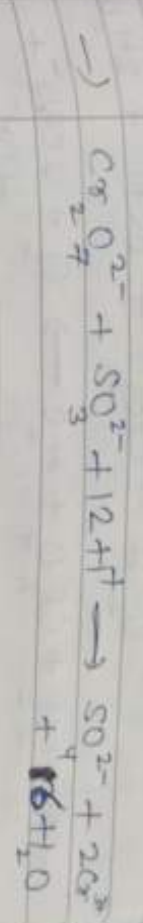
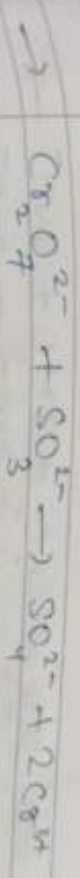
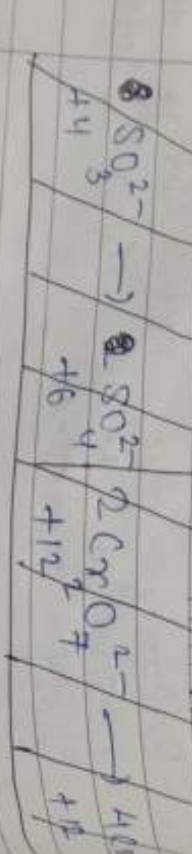
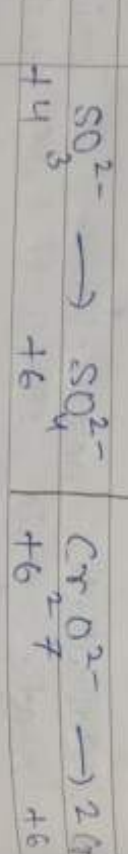
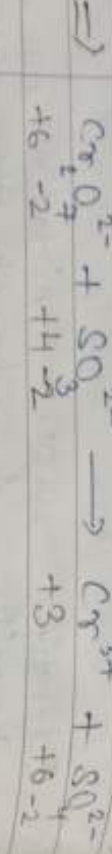
④ Calculate net change in oxidation state in both half reactions individually.

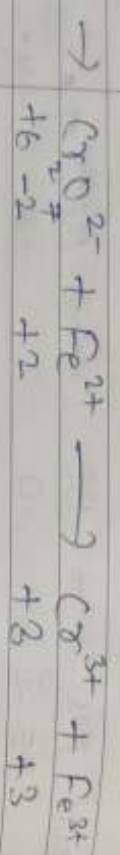
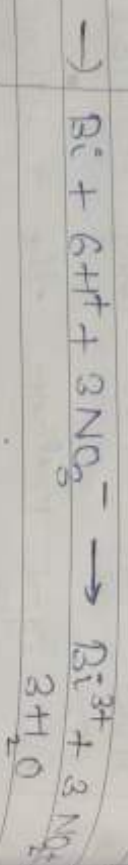
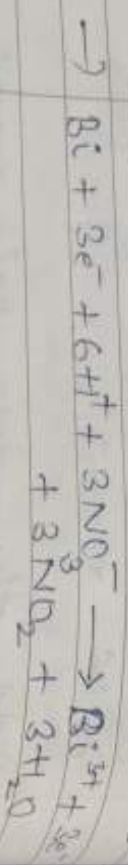
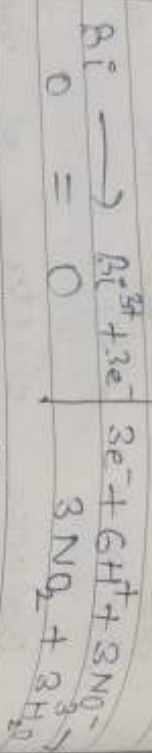
⑤ Balance the net change in oxidation state \checkmark in both half reactions.

f) Add the two half reactions

g) Balance oxygen according to medium. Method of R is same in acidic & basic medium.

For eg → Balance the reaction





~~$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 10e^-$~~

