1. Consider the reaction (Jee main- 2014 online)

$H_2SO_3(aq) + Sn^{4+}(aq) + H_2O(l) \rightarrow Sn^{2+}(aq) + HSO_4^-(aq) + 3H^+(aq)$

Which of the following statements is correct?

(1) H_2SO_3 is the reducing agent because it undergoes oxidation

(2) H_2SO_3 is the reducing agent because it undergoes reduction

(3) Sn^{4+} is the reducing agent because it undergoes oxidation

(4) Sn^{4+} is the oxidizing agent because it undergoes oxidation

Solution:

Oxidation is the loss of electrons during a reaction by a molecule. In the given equation, H_2SO_3 is the reducing agent because it undergoes oxidation.

Hence option (1) is the answer.

2. In which of the following reaction H_2O_2 acts as a reducing agent ? (Jee main 2014 online)

(1) $H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O$

(2) $H_2O_2 - 2e^- \rightarrow O_2 + 2H^+$

(3) $H_2O_2 + 2e^- \rightarrow 2OH^-$

(4) $H_2O_2 + 2OH^- - 2e^- \rightarrow O_2 + 2H_2O$

(1) (1), (3)

(2) (2), (4)

(3) (1), (2)

(4) (3), (4)

Solution:

Reducing agent is an element or compound that loses an electron to an electron recipient in a redox chemical reaction. In (2) and (4) , H_2O_2 acts as a reducing agent.

Hence option (2) is the answer.

3. Which of the following reactions is an example of a redox reaction ? (Jee main 2017)

(1) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

(2) $XeF_2 + PF_5 \rightarrow [XeF]^+ PF_6^-$

(3) $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

(4) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

Solution:

In equation (1) Xe undergoes oxidation and oxygen undergoes reduction.

Hence option (1) is the answer.

4. Which of the following is a redox reaction ?

(1) NaCl + KN03 → NaN03 + KC1

(2) CaC204 + 2HC1 → CaCl2 + H2C20,

(3) $Mg(OH)2 + 2NH4C1 \rightarrow MgCl2 + 2NH4OH$

(4) $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)2$

Solution:

A redox reaction is any chemical reaction in which the oxidation number of a molecule, atom, or ion changes by gaining or losing an electron. The oxidation state shows a change only in a reaction between zinc and cyanide.

Hence option (4) is the answer.

5. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$solution is added to it. Which of the statements is incorrect for this reaction?

(1) Cu_2I_2 is reduced

(2) Evolved I_2 is reduced

(3) $Na_2S_2O_3$is oxidized

(4) CuI_2 is formed

Solution:

$2CuSo_2 + 4KI \rightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

$I_2 + 2Na_2S_2O_3 \rightarrow Na_2S_4O_6 + 2NaI$

Here statement (4) is incorrect.

Hence option (4) is the answer.

6. Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4. The titration gives unsatisfactory result when carried out in the presence of HCl because HCl

(1) gets oxidised by oxalic acid to chlorine

(2) furnishes H^+ ions in addition to those from oxalic acid

(3) reduces permanganate to Mn^{2+}

(4) Oxidises oxalic acid to carbon dioxide and water

Solution:

HCl is a strong reducing agent. It reduces permanganate to Mn^{2+}.

Hence option (3) is the answer.

7. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

(1) +4

(2) +6

(3) +2

(4) +3

Solution:

$K_2Cr_2O_7 + 7H_2SO_4 + 6KI \rightarrow Cr_2(SO_4) + 3I_2 + 7H_2O + 4K_2SO_4$

Cr get reduced from +6 Oxidation state to +3 oxidation state.

Hence option (4) is the answer.