$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$$

$$Fe^{2+} \longrightarrow Fe^{3+} + e^-]\times 6$$

$$Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \longrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$$

(iii) $K_2Cr_2O_7$ oxidizes H_2S to sulphur.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$$

$$H_2S \longrightarrow S + 2H^+ + 2e^-]\times 3$$

$$Cr_2O_7^{2-} + 3H_2S + 8H^+ \longrightarrow 2Cr^{3+} + 3S + 7H_2O$$

Q16 :

Describe the preparation of potassium permanganate. How does the acidifiedpermanganate solution react with (i) iron(II) ions (ii) $SO_2$and (iii) oxalic acid?

Write the ionic equations for the reactions.

Answer :

Potassium permanganate can be prepared from pyrolusite (MnO_2). The ore is fused with KOH in the presence of either atmospheric oxygen or an oxidising agent, such as KNO_3or $KClO_4$, to give K_2MnO_4.

$$2MnO_2 + 4KOH + O_2 \xrightarrow{\text{heat}} \underset{(\text{Green})}{2K_2MnO_4} + 2H_2O$$

The green mass can be extracted with water and then oxidized either electrolytically or by passing chlorine/ozone into the solution.

Electrolytic oxidation

$$K_2MnO_4 \longleftrightarrow 2K^+ + MnO_4^{2-}$$

$$H_2O \longleftrightarrow H^+ + OH^-$$

At anode, manganate ions are oxidized to permanganate ions.

$$\underset{\text{Green}}{MnO_4^{2-}} \longleftrightarrow \underset{\text{Purple}}{MnO_4^-} + e^-$$

Oxidation by chlorine

$$2K_2MnO_4 + Cl_2 \longrightarrow 2KMnO_4 + 2KCl$$

$$2MnO_4^{2-} + Cl_2 \longrightarrow 2MnO_4^- + 2Cl^-$$