

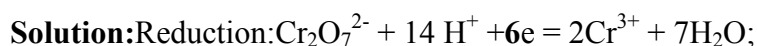
Task#76556

In a reaction it was found that 3.0g of a metal *X* was oxidized by 25.0 cm³ of 0.10 mol dm⁻³ K₂Cr₂O₇ under acidic conditions.

(i) Deduce the mole of ratio between *X* and Cr₂O₇²⁻ ion.

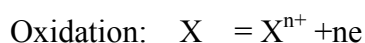
(ii) write a balanced equation of the redox reaction.

(iii) Give the oxidation numbers of chromium and *X* in both their reduced and oxidized forms.[Molar mass of *X* = 200.6



[Equivalent weight of K₂Cr₂O₇ = molecular weight /6 =M/6],

Where, M=Molecular weight of K₂Cr₂O₇



[Equivalent weight of X = 200.6/n]

(i)Concentration of K₂Cr₂O₇ Solution =0.10 mol dm⁻³ = 0.1mol/lit = (0.1x M)g/lit =0.1x6 gm-equivalent/lit= 0.6 Normal =0.6(N) ; [1dm³ =1000cc = 1lit]

So, 1000cc 1(N) K₂Cr₂O₇ solution =200.6/n gm of X ;

1cc 1(N) K₂Cr₂O₇ solution =0.2006/n gm of X;

25cc 0.6(N) K₂Cr₂O₇ solution = 0.2006 x25x 0.6/n of X;

From given condition ,

$$0.2006 \times 25 \times 0.6/n = 3$$

$$n = 0.2006 \times 25 \times 0.6/3 = 1.003$$

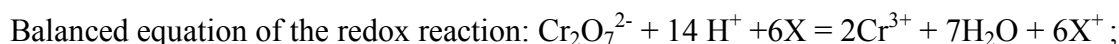
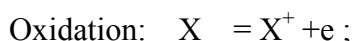
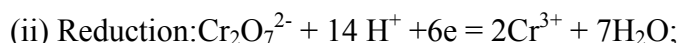
$$n = 1$$

Amount of K₂Cr₂O₇ in 25ml 0.10 mol/lit solution = $\frac{0.1 \times 25}{1000}$ mol = 2.5 X10⁻³ mol

Amount of X in solution = $\frac{3\text{g}}{200.6\text{g/mol}}$ = 0.014955 mol

Mol ratio between X and K₂Cr₂O₇ = $\frac{0.014955}{2.5 \times 10^{-3}}$ = 6;

That means for one mol of K₂Cr₂O₇ oxidises 6mols of metal X.



(iii) Oxidation number of Chromium in Cr₂O₇²⁻ (oxidised form)=x=6, and in reduced form(Cr³⁺)=3

[2x +7(-2) =-2 ,or,x =6],metal (reduced form,X) =0, oxidised form (X⁺)=1;