Stawa Set 22

SET 22

1. In a titration 29.0 mL of potassium permanganate solution was required to oxidise 25.0 mL of 0.105 mol L^{-1} iron(II) sulfate solution in the presence of dilute sulfuric acid. Calculate the concentration of the permanganate solution. The equation for the reaction is:

   $MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$

2. 25.0 mL of acidified oxalic acid solution required 31.2 mL of 0.0201 mol L^{-1} potassium permanganate solution for oxidation. Calculate the concentration of the oxalic acid. The equation for the reaction is:

   $2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

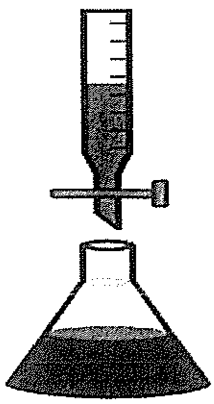
3. The concentration of an iron(II) sulfate solution was determined by titration with 0.0214 mol L^{-1} potassium dichromate solution. 20.0 mL of the iron(II) sulfate solution, acidified with dilute sulfuric acid, required 20.5 mL of the dichromate solution for complete oxidation. Calculate the iron(II) sulfate solution concentration. The equation for the reaction is:

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

4. What volume of 0.0432 mol L^{-1} potassium permanganate is needed to completely oxidise 25.0 mL of 0.108 mol L^{-1} $SnCl_2$ in acid solution?

5. What volume of 0.0200 mol L^{-1} potassium permanganate is needed to oxidise 1.03 g ammonium iron (II) sulfate, $(NH_4)_2Fe(SO_4)_2.6H_2O$, in dilute sulfuric acid solution?

6. What mass of pure crystalline oxalic acid, $H_2C_2O_4.2H_2O$, will be oxidised by 25.0 mL of 0.0192 mol L^{-1} potassium permanganate in the presence of 6 mol L^{-1} sulfuric acid?



7. 35.0 mL of oxalic acid solution is acidified with dilute sulfuric acid and oxidised exactly with 20.0 mL of potassium permanganate solution. 5.60×10^2 mL of carbon dioxide at S.T.P. is produced in the reaction. Calculate the concentrations of

(a) the oxalic acid solution, and
(b) the potassium permanganate solution.

8. 1.00 mL of a 3.00% hydrogen peroxide solution was oxidised with 0.0205 mol L^{-1} acidified potassium permanganate solution. Assuming the density of the hydrogen peroxide solution was 1.00 g mL^{-1}, calculate the volume of potassium permanganate required.

9. 1.63 g of iron wire was dissolved in dilute sulfuric acid. The solution was filtered, transferred to a volumetric flask and made up to 250.0 mL with distilled water. 20.0 mL of this solution required 18.1 mL of 0.0209 mol L^{-1} potassium dichromate for complete reation. Find the percentage of iron in the iron wire.

10. The percentage by mass of chromium is a mineral is determined by converting a sample of known mass into sodium dichromate, and titrating an acidified solution of the sodium dichromate with a standard solution of iron(II) sulfate. Using this method, 1.27 g of a chromium-containing mineral was converted into an acidified solution of sodium dichromate, which required 37.5 mL of 0.400 mol L^{-1} iron(II) sulfate to reach the end-point. Calculate the percentage by mass of chromium in the mineral.

11. A 0.752 g sample of impure sodium sulfite was oxidised by titration with acidified 0.0993 mol L^{-1} $K_2Cr_2O_7$ solution. 17.2 mL of the dichromate solution was used in the titration. Calculate the percentage purity of the sodium sulfite.

12. A 3.08 g sample of haematite was dissolved in sulfuric acid, reduced to Fe^{2+} and diluted to 250.0 mL in a volumetric flask. A 25.0 mL sample of this solution was titrated with 0.0260 mol L^{-1} potassium permanganate solution. A volume of 28.7 mL of $KMnO_4$ was needed to reach the end point. Calculate the percentage of Fe_2O_3 in the haematite.

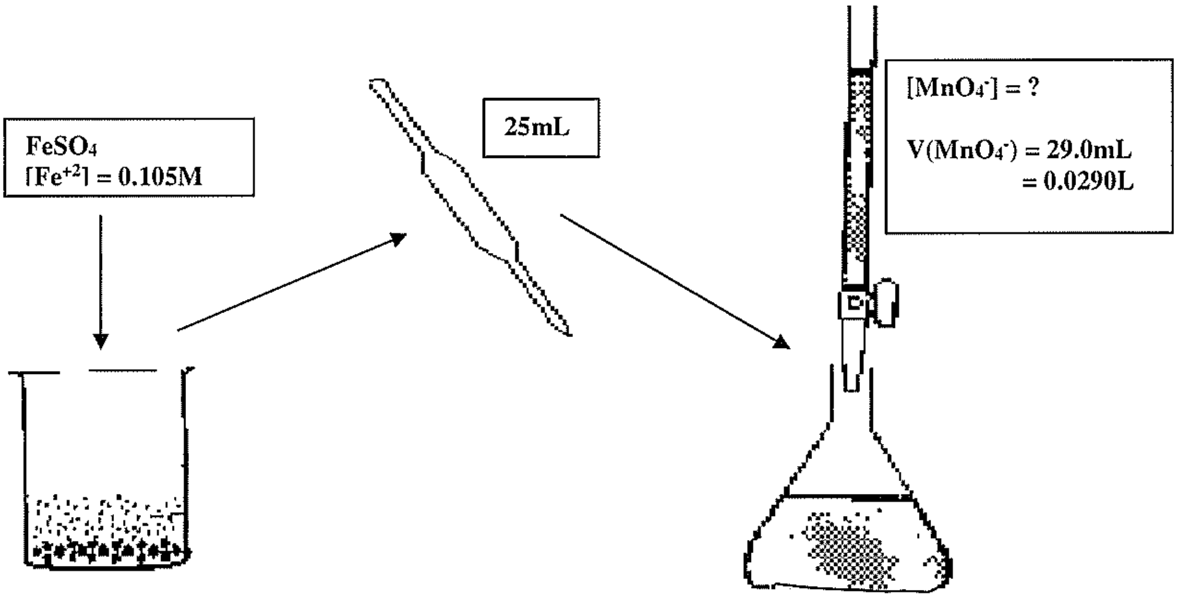
13. A sample of iron ore consisting of a mixture of FeO and Fe_2O_3 was dissolved in dilute sulfuric acid. The resultant solution was divided into two equal aliquots. The first aliquot was titrated with a potassium permanganate solution containing 6.30 g of $KMnO_4$ per litre, and required 15.0 mL for complete reaction. The second aliquot was reduced with zinc and the solution then titrated with the permanganate solution. 25.1 mL was required for the second oxidation. Calculate the mass of each iron oxide in the original sample.

14. A solution of commercial bleach is analysed to determine the percentage by mass of sodium hypochlorite (NaClO) in the solution. 10.0 mL of the commercial bleach is pipetted into a volumetric flask and made up to the 100.0 mL mark with distilled water. A 25.0 mL aliquot of the diluted bleach is placed in a flask with excess potassium iodide. The iodine produced is titrated with 0.845 mol L-1 sodium thiosulfate ($Na_2S_2O_3$) solution using starch as an indicator. 17.9 mL of the thiosulfate solution was required for complete reaction. Assuming the density of the original bleach solution to be 1.00 g mL^{-1}, calculate the percentage of NaClO in the bleach. The reactions involved are:

$$ClO^- + 2I^- + 2H^+ \rightarrow I_2 + Cl^- + H_2O$$
$$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$$

STAWA SET 22
WORKED SOLUTIONS

1.



$$MnO_4^- + 5Fe^{+2} + 8H^+ \rightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$$

<u>$FeSO_4$</u>

n = ? $n(Fe^{2+}) = CV$

C = 0.105M $= 0.105 \times 0.025$

V = 0.025L $\therefore n(Fe^{2+}) = 0.002625\ mol$

$$n(MnO_4^-) = \frac{1}{5}\ n\ (Fe^{+2})$$

$$= \frac{1}{5} \times 0.002625$$

$$= 0.000525\ mol$$

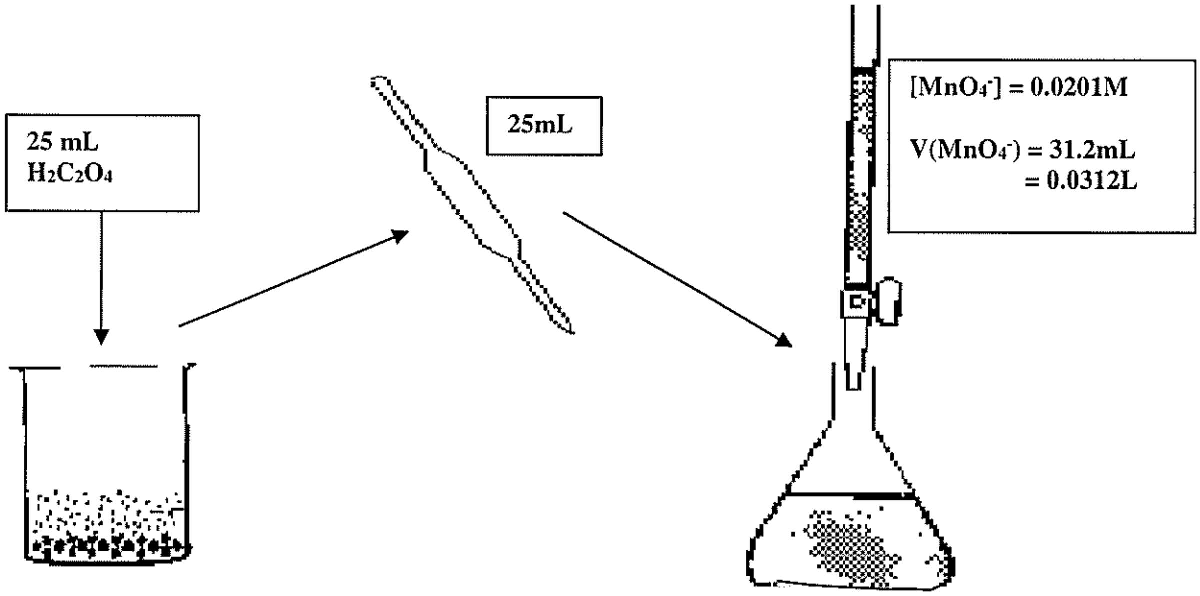
<u>MnO_4^-</u>

n = 0.000525 mol $C = \frac{n}{V}$

C = ? $= \frac{0.000525}{0.029}$

V = 0.029L $\therefore [MnO_4^-] = 1.81 \times 10^{-2} M$

2.



$$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$$

$\underline{MnO_4^-}$

n = ?　　　　　　　　　$n = CV$

C = 0.0201 m　　　　　$= 0.0201 \times 0.0312$

V = 0.0312L　　　　　$\therefore \underline{n(MnO_4^-) = 0.000627\,mol}$

$$\mathbf{n\ (H_2C_2O_4)} = \frac{5}{2}\ n(\ MnO\ _4^-)$$

$$= \frac{5}{2}\ x\, 0.000627$$

$$= \underline{0.0015678 mol}$$

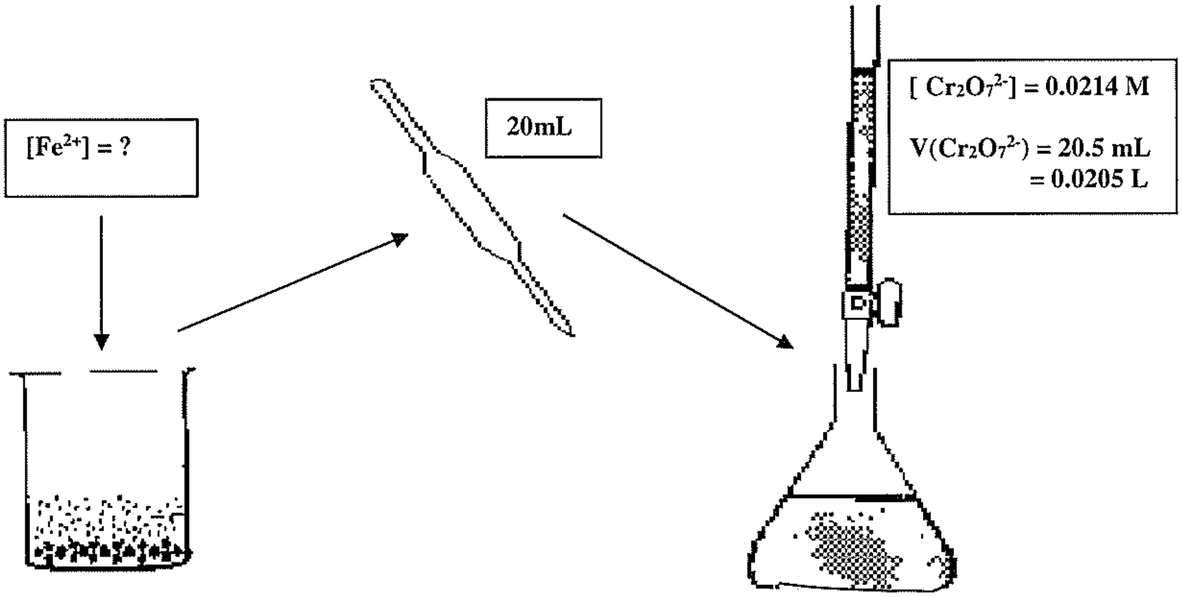
$\underline{(H_2C_2O_4)}$

n =?　　　　　　　　　$C = \frac{n}{V}$

C = 0.0201 M　　　　　$= \frac{0.0015678}{0.025}$

V = 0.0312L　　　　　$\therefore \underline{\underline{\mathbf{[H_2C_2O_4] = 6.27x10^{-2}\,M}}}$

3.



$$Cr_2O_7^{-2} + 6\,Fe^{+2} + 14H^+ \rightarrow 2Cr^{+3} + 6\,Fe^{+3} + 7H_20$$

<u>$Cr_2O_7^{-2}$</u>

n = ?
C = 0.0214m
V = 0.0205L

$n = CV$

$= 0.0214 \times 0.0205$

$\therefore n(Cr_2O_7^{-2}) = 0.0004387$ mol

$n(Fe^{+2}) = 6 \times n\,(Cr_2O_7^{-2})$

$= 6 \times 0.0004387$

$= 0.0026322$ mol

<u>(Fe^{+2})</u>

n = 0.0026 mol

C= ?

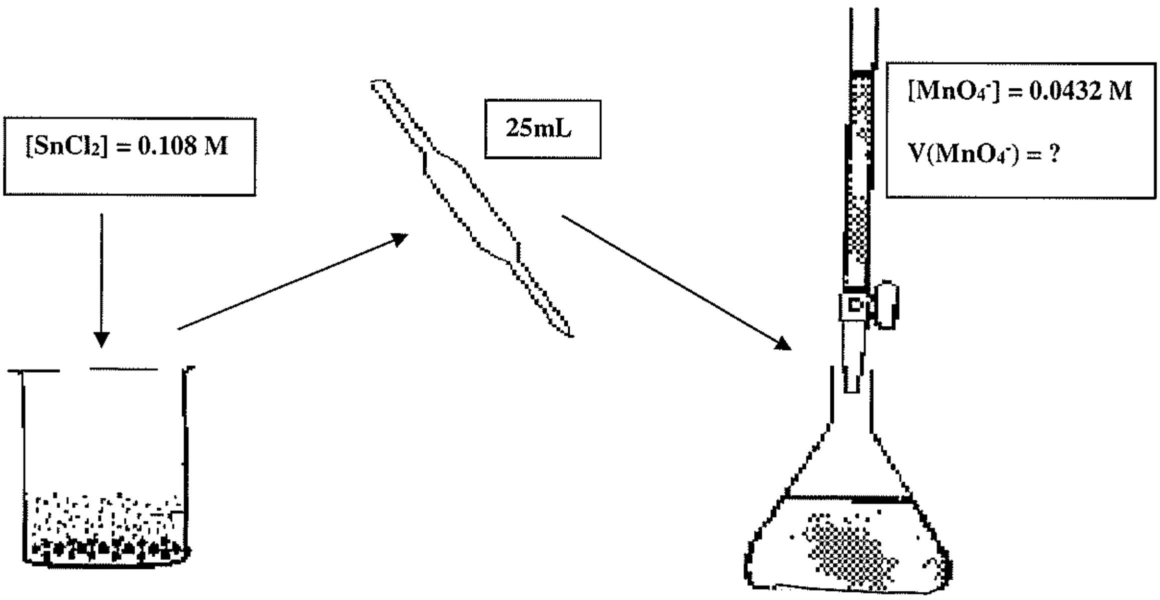
V = 0.02L

$$C = \frac{n}{V}$$

$$= \frac{0.0026}{0.02}$$

$$\therefore [Fe^{+2}] = 1.31 \times 10^{-1} M$$

4.



$$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O) \quad x2$$
$$(Sn^{+2} \rightarrow Sn^{+4} + 2e^-) \quad x5$$

$$\therefore \underline{2MnO_4^- + 16H^+ + 5Sn^{+2} \Rightarrow 2Mn^{+2} + 5Sn^{+4} + 8H_2O}$$

$\underline{SnCl_2}$

n = ? $\quad$ n = CV

C= 0.108M $\quad$ = 0.108 x 0.025

V = 0.025L $\quad$ $\therefore \underline{n(SnCl_2) = n(Sn^{2+}) = 0.0027 mol}$

$$n(MnO_4^-) = \frac{2}{5} \ x \ n(Sn^{2+})$$
$$= \frac{2}{5} x 0.0027$$
$$\underline{= 0.00108 \text{ mol}}$$

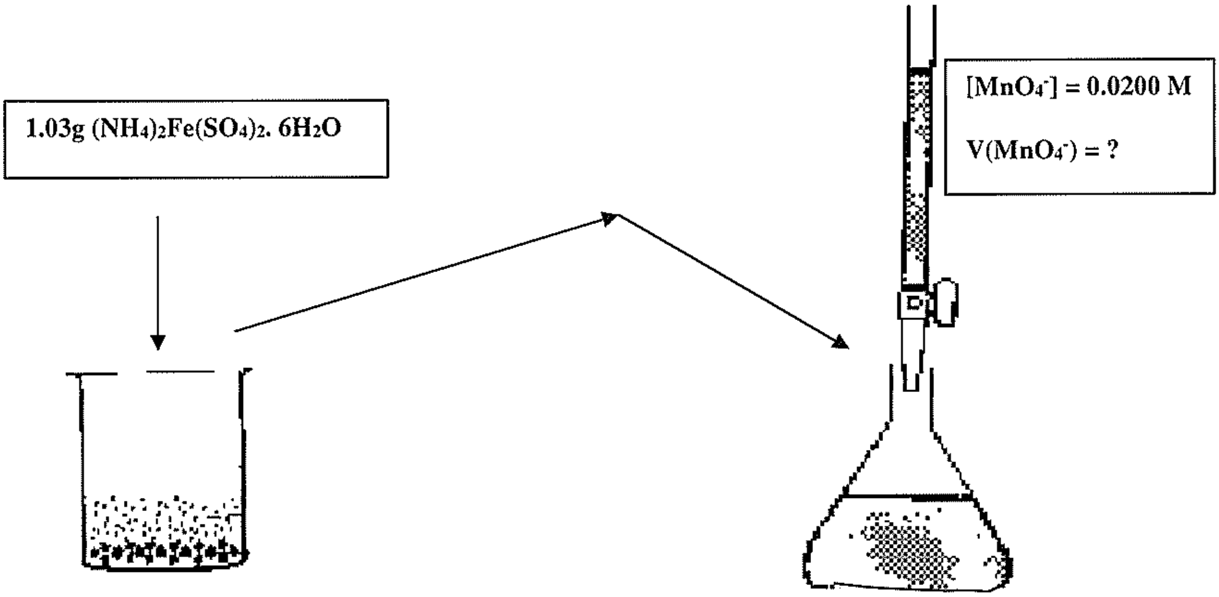
$\underline{MnO_4^-}$

n = 0.00108 mol $\quad$ $V = \frac{n}{C}$

C = 0.0432 m $\quad$ $= \frac{0.00108}{0.0432}$

V = ? $\quad$ $\therefore \underline{\underline{V(MnO_4^-) = 0.025L}}$

5.



$$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O) \qquad x1$$
$$(Fe^{+2} \rightarrow Fe^{+3} + e^-) \qquad x5$$

$$\therefore \underline{\mathbf{MnO_4^- + 8H^+ + 5Fe^{+2} \Rightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}}}$$

$\underline{Fe^{+2}}$

n = ? $\qquad n = \frac{m}{M}$

m = 1.03g $\qquad = \frac{1.03}{392}$

M = 392 g mol^{-1} $\qquad \therefore \underline{n(Fe^{+2}) = 2.63x10^{-3}}mol$

$$\mathbf{n\ (Mn\ O_4^-)\ =\ \frac{1}{5}\ x\ \ n(Fe^{+2})}$$
$$= \frac{1}{5} x\ 2.63x10^{-3}$$
$$= \underline{5.26 \times 10^{-4}}$$

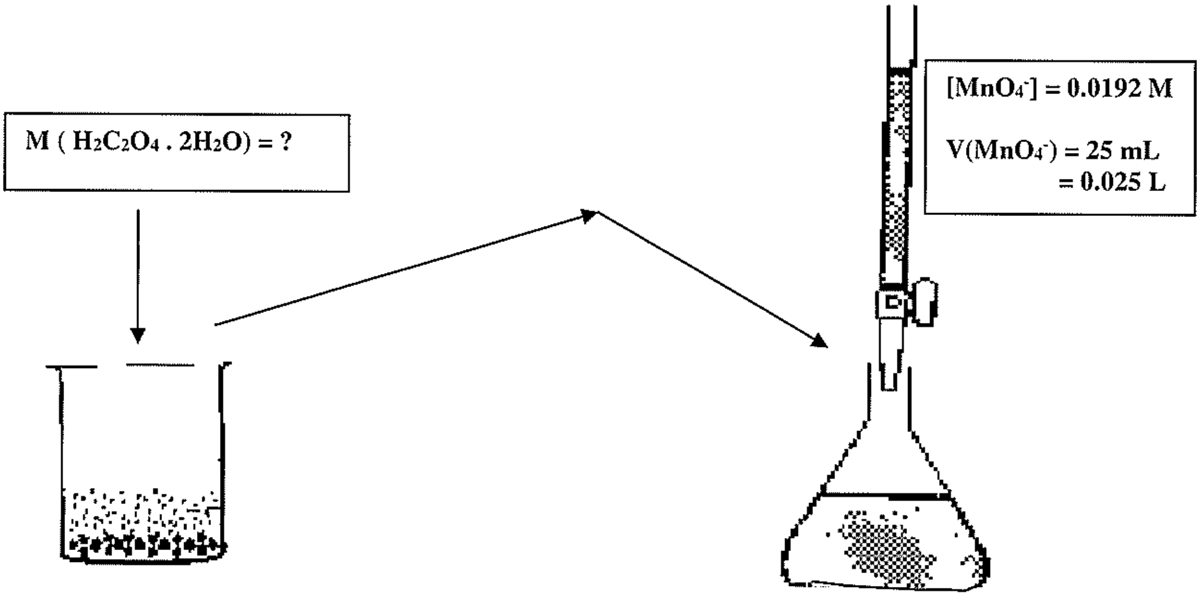
$\underline{MnO_4^-}$

n = 5.26×10^{-4} mol $\qquad V = \frac{n}{C}$

C = 0.02 M $\qquad = \frac{5.26x10^{-4}}{0.02}$

V = ? $\qquad \therefore \underline{\mathbf{V(MnO_4\text{-}) = 2.63 \times 10^{-2}\ L}}$

6.



$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O)$ x2

$(H_2C_2O_4 \rightarrow 2CO_2 + 2H^+ + 2e^-)$ x5

$\therefore 2MnO_4^- + 5H_2C_2O_4 + 16H^+ \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O + 10H^+$

$\underline{\mathbf{2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O}}$

$\underline{MnO_4^-}$

n = ? n = CV

C = 0.0192 mol = 0.0192 x 0.025

V = 0.025L $\therefore \underline{n(MnO_4^-) = 0.00048 mol}$

$$\mathbf{n(H_2C_2O_4 . 2H_2O)} = \frac{5}{2} \times \mathbf{n(MnO_4^-)}$$

$$= \frac{5}{2} \times 0.00048$$

$$= \underline{0.0012 \text{ mol}}$$

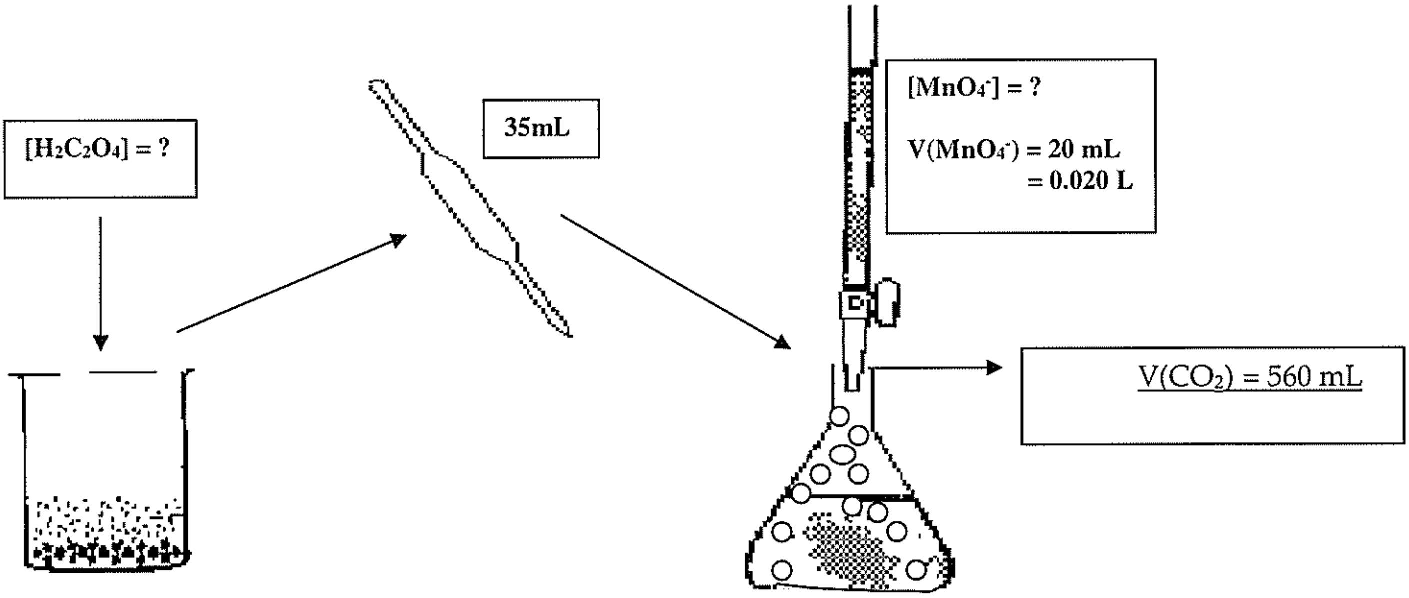
$\underline{H_2C_2O_4 . 2H_2O}$

n = 0.0012 mol m = nM

m = ? = 0.0012 x 126

M = 126 g mol^{-1} $\therefore \underline{\mathbf{(H_2C_2O_4 . 2H_2O) = 1.51 \times 10^{-1} g}}$

7.



(a) $(H_2C_2O_4 \prod 2CO_2 + 2H^+ 2e^-)$ x5

$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O)$ x 2

$\therefore 5H_2C_2O_4 + 2MnO_4^- + 16H^+ \rightarrow 10CO_2 + 2Mn^{+2} + 10\ H^+ + 8H_2O$

<u>**$5H_2C_2O_4 + 2MnO_4^- + 6H^+ \rightarrow 10CO_2 + 2Mn^{+2} + 8H_2O$**</u>

<u>CO_2</u>

n = ?

V= 0.56L

$$n = \frac{V}{22.4} = \frac{0.56}{22.4}$$

<u>$n(CO_2) = 0.025$mol</u>

$n\ (H_2C_2O_4)$ = ½ x n (CO_2)

= ½ x 0.25

= <u>0.0125 mol</u>

<u>($H_2C_2O_4$)</u>

n = 0.125 mol

C = ?

V = 0.035L

$$C = \frac{n}{V} = \frac{0.125}{0.035}$$

$\therefore$ <u>**[$H_2C_2O_4$] = 3.57 x 10^{-1} M**</u>

(b)

$$\mathbf{n\ (MnO_4^-) = \frac{1}{5}\ x\ n\ (CO_2)}$$

$$= \frac{1}{5} \times 0.025$$

$$= \underline{0.005\ mol}$$

$\underline{(MnO_4^-)}$

n = 0.005 mol

C = ?

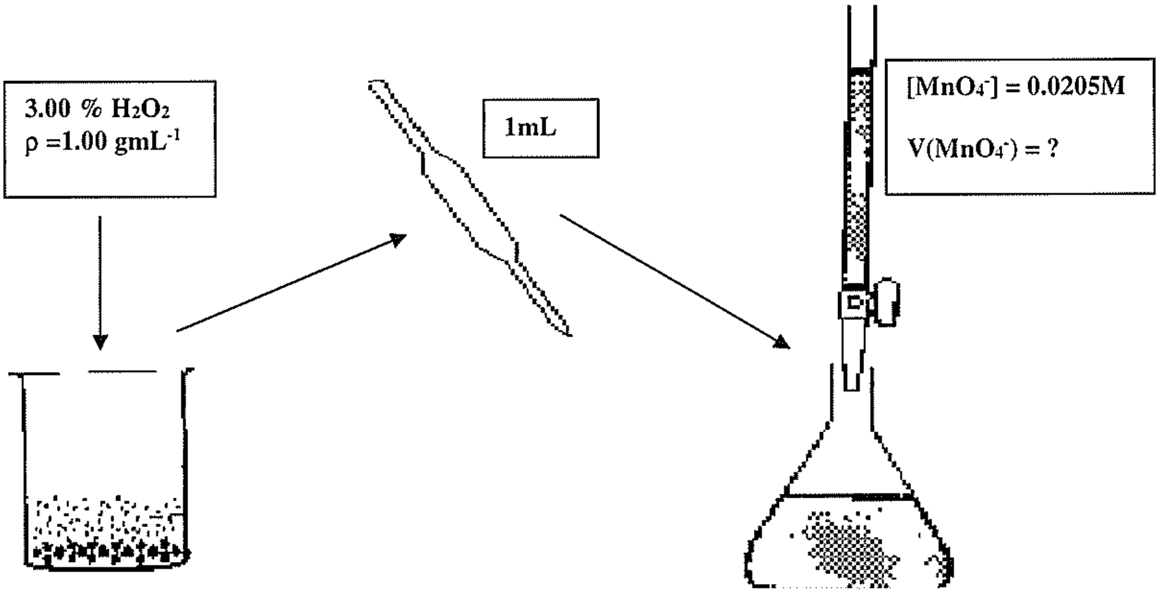
V = 0.02L

$$C = \frac{n}{V}$$

$$= \frac{0.05}{0.02}$$

$$\therefore \underline{\mathbf{[MnO_4^-] = 0.250M}}$$

8.



$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O)$ x2

$(H_2O_2 \rightarrow O_2 + 2H^+ + 2e^-)$ x5

$\therefore\ 2MnO_4^- + 5H_2O_2 + 16H^+ \rightarrow 2Mn^{+2} + 5O_2 + 10H^+ + 8H_2O$

$\underline{2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{+2} + 5O_2 + 8H_2O}$

$\underline{(H_2O_2)}$

n = ? $\quad n = \frac{m}{M}$

m = 0.03g $\quad = \frac{0.03}{34}$

M = $34 gmol^{-1}$ $\quad \therefore\ \underline{n(H_2O_2) = 8.82 \times 10^{-4}\ mol}$

$$\mathbf{n\ (MnO_4^-) = \frac{2}{5} \times n\ (H_2O_2)}$$

$$= \frac{2}{5} \times 8.82 \times 10^{-4}$$

$$\underline{= 3.53 \times 10^{-4}\ mol}$$

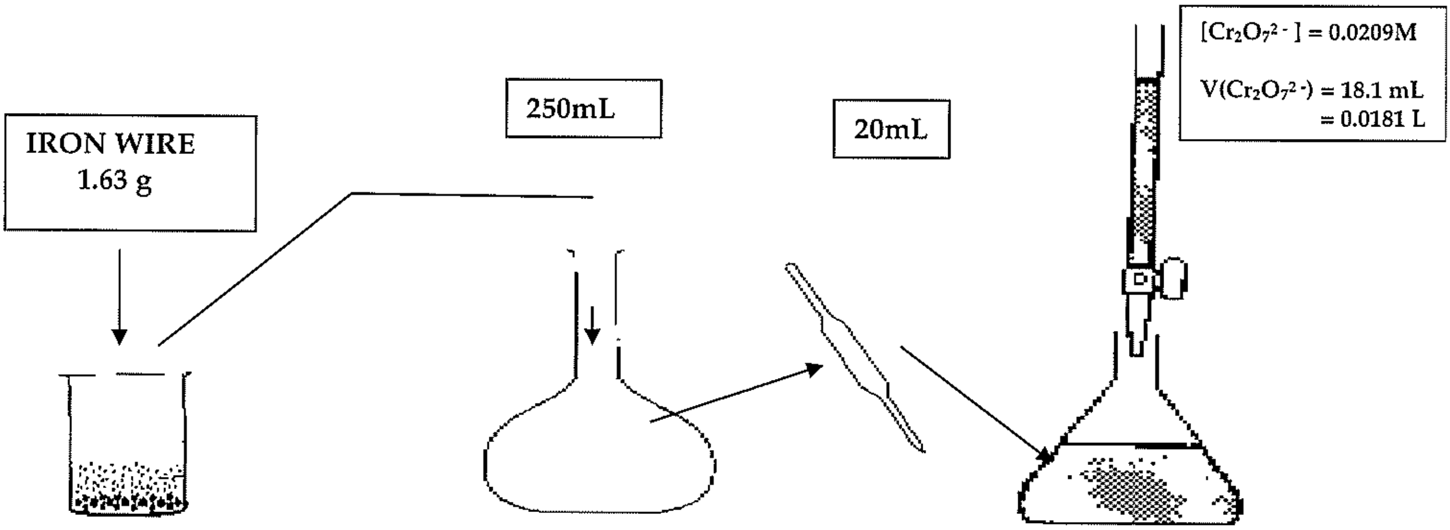
$\underline{MnO_4^-}$

n = 3.53×10^{-4} mol $\quad V = \frac{n}{C}$

C = 0.0205m $\quad = \frac{3.53x10^{-4}}{0.0205}$

V = ? $\quad \therefore\ \mathbf{V\underline{(MnO_4^-) = 1.72 \times 10^{-2} L}}$

9.



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

$$(Fe^{+2} \rightarrow Fe^{+3} + e^-) \qquad \times 6$$

$$\therefore \underline{\mathbf{Cr_2O_7^{-2} + 6Fe^{+2} + 14H^+ \rightarrow 2Cr^{+3} + 6Fe^{+3} + 7H_2O}}$$

∴

$\underline{Cr_2O_7^{-2}}$

n=?

C = 0.0209M

V = 0.0181L

$n = CV$

$= 0.0209 \times 0.0181$

$\therefore \underline{n(Cr_2O_7^{-2}) = 0.00037829\text{mol}}$

$$\mathbf{n\ (Fe^{+2})_{in\ 20mL} = 6 \times n\ (Cr_2O_7^{-2})}$$
$$= 6 \times 0.00037829$$
$$= \underline{0.00226974\ \text{mo}}$$

$$\mathbf{n\ (Fe^{+2})_{in\ 250mL} = \frac{250}{20} \times n\ (Fe^{+2})_{in\ 20mL}}$$
$$= \frac{250}{20} \times 0.00226974$$
$$= \underline{0.02837\ \text{mol}}$$

$\underline{Fe^{+2}}$

n = 0.02837 mol

m = ?

M = 55.8gmol-1

$m = nM$

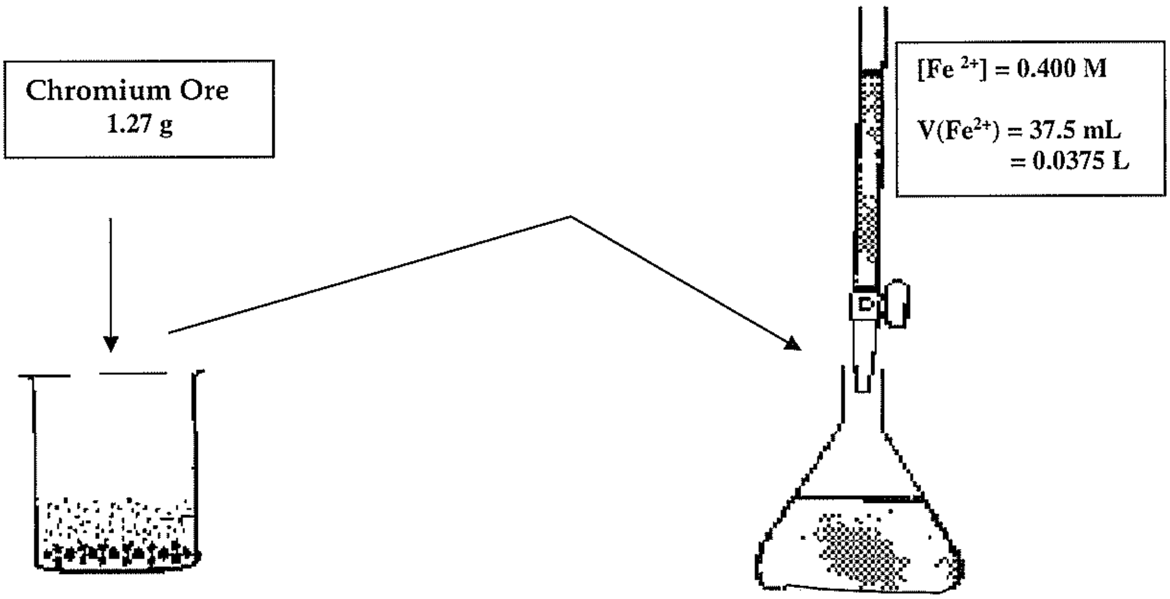
$= 0.02837 \times 55.8$

$\therefore \underline{m(Fe^{+2}) = 1.583g}$

m(Fe) = m(Fe+2)

$$\%\ Fe = \frac{1.583}{1.63} \times 100$$
$$= \underline{\underline{97.1\%}}$$

10.



$$(Cr_2O_7^{-2} + 14H^+ + 6e^- \rightarrow 2Cr^{+3} + 7H_2O) \qquad \times 1$$

$$(Fe^{+2} \rightarrow Fe^{+3} + e^-) \qquad \times 6$$

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

$\underline{\underline{Fe^{+2}}}$

n = ?
C = 0.4m
V = 0.0375L

n = CV
= 0.4 x 0.0375
$\therefore$ $\underline{n(Fe^{+2}) = 0.015 \text{ mol}}$

$$\mathbf{n(Cr_2O_7^{-2})} = \frac{1}{6} \times \mathbf{n\ (Fe^{+2})}$$

$$= \frac{1}{6} \times 0.015$$

$$= \underline{0.0025 \text{ mol}}$$

$\underline{\underline{Cr^{+3}}}$

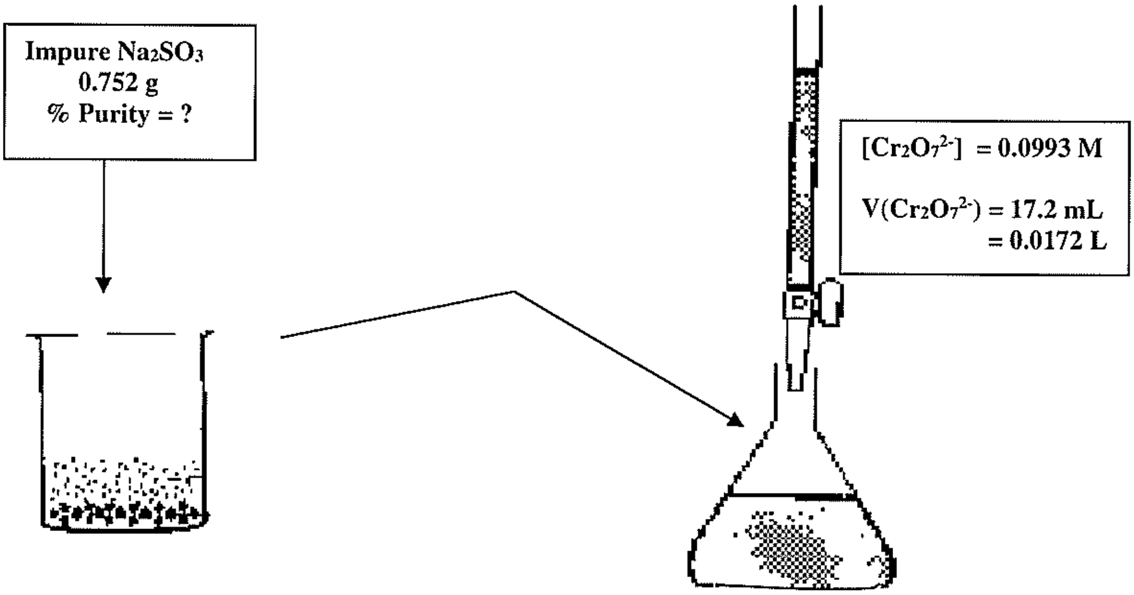
n = 0.005mol
m = ?
M = 52.0 $gmol^{-1}$

m = nM
= 0.005 x 52
$\therefore$ $\underline{m(Cr^{+3}) = 0.260 \text{ g}}$

$$\% \text{ of Cr} = \frac{0.26}{1.27} \times 100$$

$$= \underline{\underline{\mathbf{20.5\%}}}$$

11.



$(SO_3^{2-} + H_2O \rightarrow SO_4^{2-} + 2H^+ + 2e^-)$ x 3

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

$Cr_2O_7^{-2} + 3SO_3^{2-} + 14H^+ + 3H_2O \rightarrow 2Cr^{+3} + 3SO_4^{2-} + 6H^+ + 7H_2O$

$\mathbf{\underline{Cr_2O_7^{-2} + 3SO_3^{2-} + 8H^+ \rightarrow 2Cr^{+3} + 3SO_4^{2-} + 4H_2O}}$

$\underline{Cr_2O_7^{-2}}$

n = ?

C = 0.0993M

V = 0.0172L

n = CV

= 0.0993 x 0.172

∴ $\underline{n(Cr_2O_7^{-2}) = 0.00170796 \text{ mol}}$

$n(Na_2SO_3)$ = 3 x n $(Cr_2O_7^{-2})$

= 3 x 0.00170796

= $\underline{0.00512388 \text{ mol}}$

$\underline{Na_2SO_3}$

n = 0.005124 mol

m = ?

M = 126.1 $gmol^{-1}$

m = nM

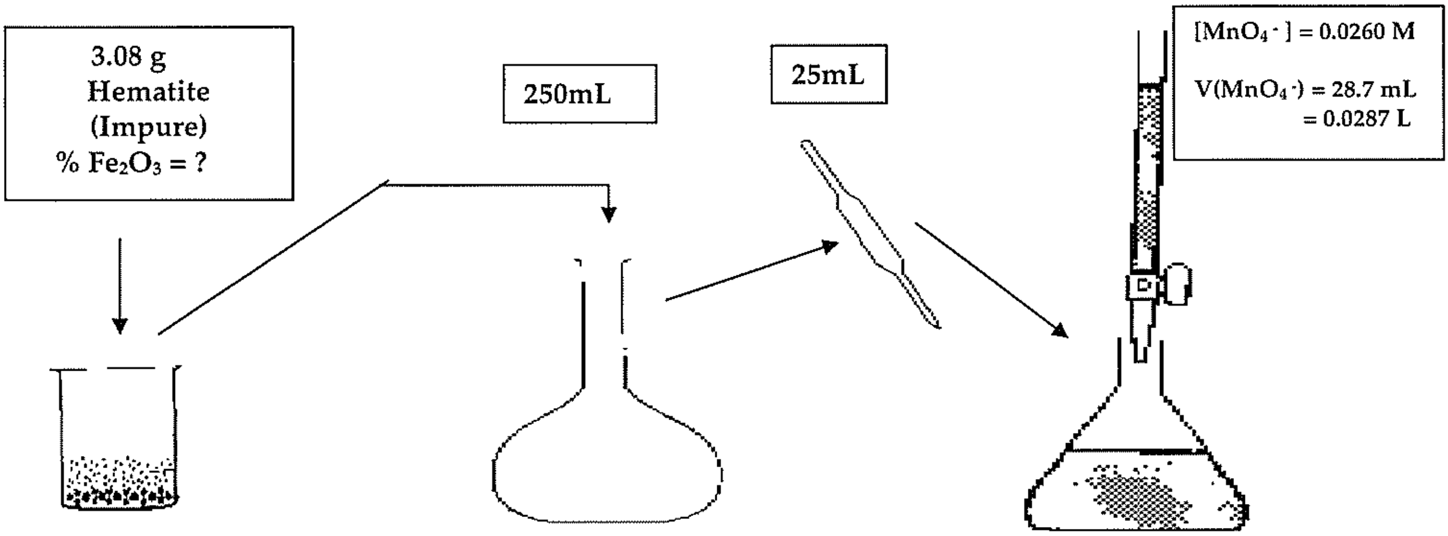
= 0.005124 x 126.1

∴ $\underline{m(Na_2SO_3) = 0.646 \text{ g}}$

$$\% \text{ of } Na_2SO_3 = \frac{0.646}{0.755} x100$$

$$= \underline{85.9\%}$$

12.



$$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O) \qquad x1$$

$$(Fe^{+2} \rightarrow Fe^{+3} + e^-) \qquad x5$$

$$\therefore \underline{MnO_4^- + 8H^+ + 5Fe^{+2} \Rightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}}$$

$\underline{MnO_4^-}$

n = ?
C = 0.0260M
V = 0.0287L

n = CV
= 0.0260 x 0.0287
$\therefore$ $\underline{n(MnO_4^-) = 0.0007462mol}$

$$n(Fe^{+2})_{in\ 25\ mL} = 5 \times n\,(MnO_4^-)$$
$$= 5 \times 0.0007462$$
$$= \underline{0.003731mol}$$

$$n\,(Fe^{+2})_{in\ 250mL} = \frac{250}{25} \times n\,(Fe^{+2})_{in\ 25mL}$$
$$= \frac{250}{25} \times 0.003731$$
$$= \underline{0.03731\ mol}$$

$$\mathbf{n(Fe^{3+})_{in\ hematite} = n(Fe^{2+})_{in\ analysis}}$$

$$= \underline{0.03731 mol}$$

$$\mathbf{n(Fe_2O_3) = \frac{1}{2} \times n(Fe^{3+})}$$

$$= \frac{1}{2} \times 0.03731$$

$$= \underline{0.018655\ mol}$$

<u>Fe_2O_3</u>

n = 0.018655 mol
m = ?
M = 55.8 + 55.8 + 48
= 159.6 $gmol^{-1}$

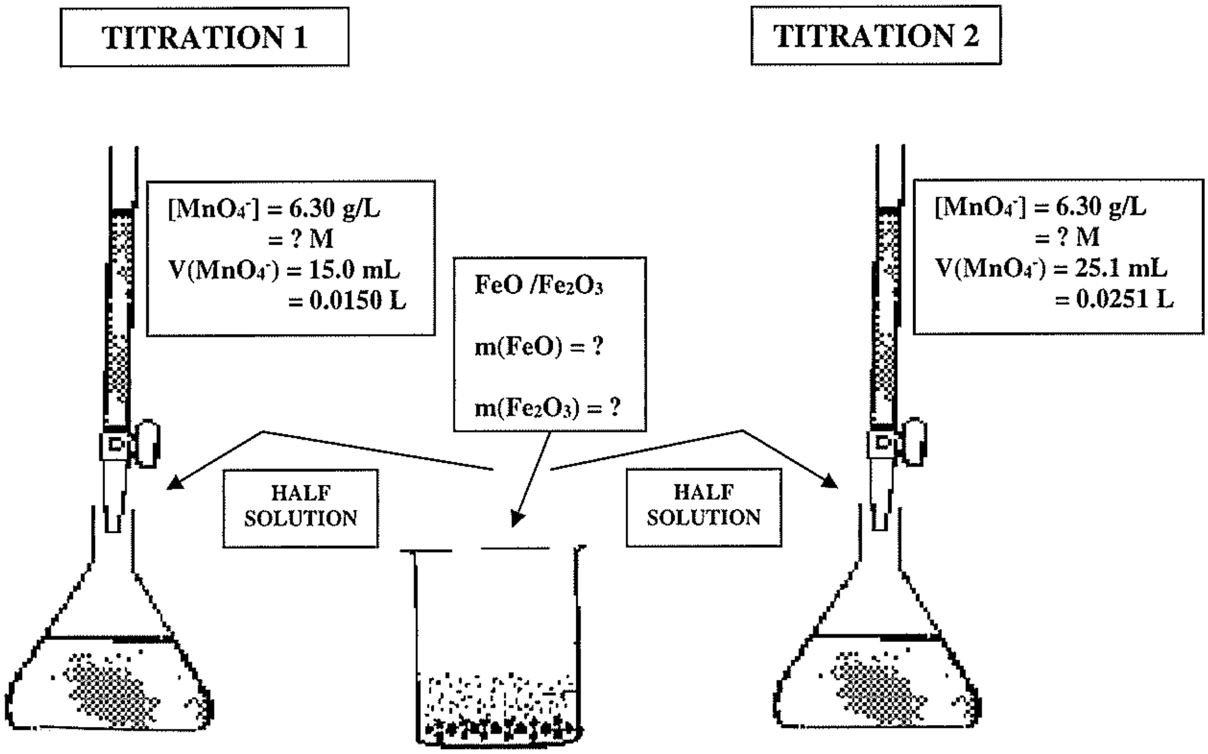
m = n M
= 0.018655 x 159.6
∴ <u>m (Fe_2O_3) = 2.977338 g</u>

$$\therefore\ \%\ Fe_2O_3 \text{ in hematite} = \frac{2.977338}{3.08} \times 100$$

$$= 96.666$$

$$= \underline{\underline{96.7\%}}$$

13.



$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O)$ x1

$(Fe^{+2} \rightarrow Fe^{+3} + e^-)$ x5

$$\therefore \underline{MnO_4^- + 8H^+ + 5Fe^{+2} \Rightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}}$$

$\underline{MnO_4^-}$

n = ?
C = 0.0399 M
V = 0.015L

n = CV
= 0.0399 x 0.015
∴ $\underline{n(MnO_4^-) = 0.0005985mol}$

$n(Fe^{+2})$ = $5 \times n(MnO_4^-)$
= 5 x 0.0005985
= $\underline{0.0029925mol}$

$\underline{\text{Total Number of } Fe^{+2} \text{(Titrated only Half)}}$

$n(Fe^{+2})$ = 2 x 0.00298
= $\underline{0.005985 \text{ mol}}$

<u>FeO</u>

n = 0.005985 mol

m = ?
M = 55.8 + 16
= 71.8 $gmol^{-1}$

$n = \frac{m}{M}$

m = nM

= 0.005985 x 71.8

∴ m (FeO) = 0.4297g
= **$\underline{0.430g}$**

$\underline{MnO_4^-}$

n = ?
C = 0.0399 M
*V = 0.0101 L

* Volume Differential

n = CV
= 0.0399 x 0.0101
∴ $\underline{n(MnO_4^-) = 0.000402 mol}$

$n(Fe^{+2}) = 5 \times n(MnO_4^-)$
$= 5 \times 0.00402$
$= \underline{0.00201\ mol}$

Total Number of Fe^{+3} (Titrated only Half)

$n(Fe^{+3}) = 2 \times 0.00201$
$= \underline{0.00402\ mol}$

$$\mathbf{n(Fe_2O_3) = \frac{1}{2} \times n(Fe^{3+})}$$

$$= \frac{1}{2} \times 0.00402$$

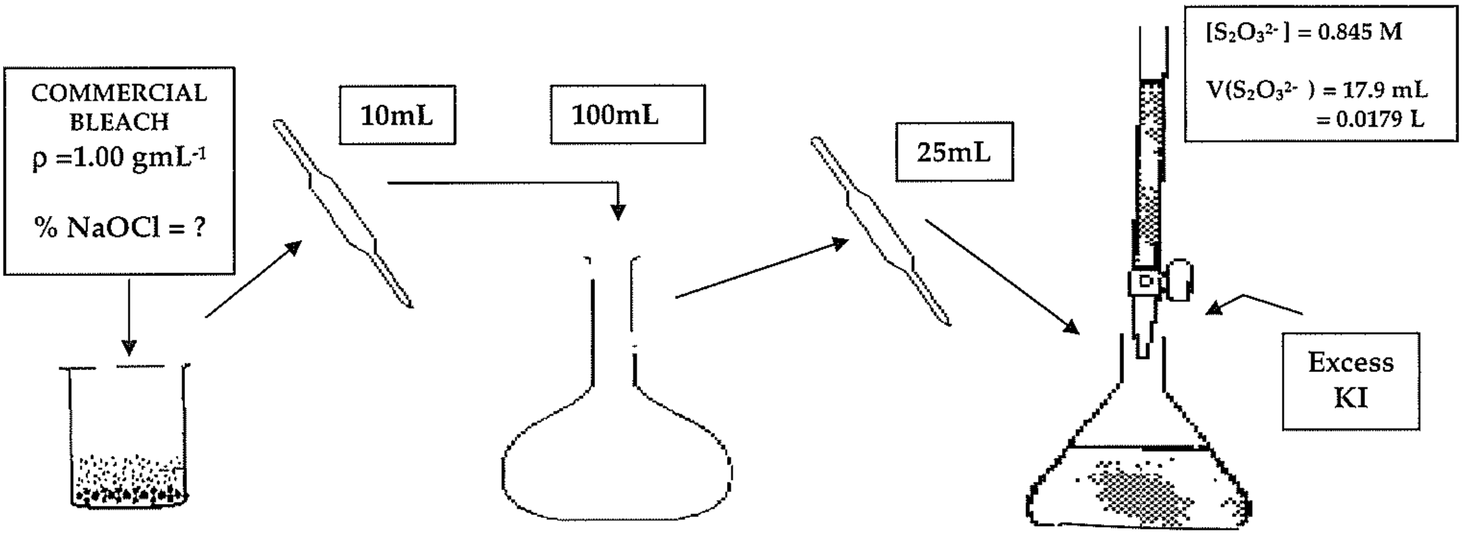
$$= \underline{0.00201\ mol}$$

$\underline{Fe_2O_3}$

n = 0.00201 mol
m = ?
M = 55.8 + 55.8 + 48
= 159.6 $gmol^{-1}$

m = n M
= 0.00201 x 159.6
∴ **$\underline{m\ (Fe_2O_3) = 0.321\ g}$**

14.



$$ClO^- + 2I^- + 2H^+ \rightarrow Cl^- + I_2 + H_2O$$

$$2S_2O_3{}^{2-} + I_2 \rightarrow S_4O_6{}^{2-} + 2I^-$$

$\underline{Na_2S_2O_3}$

n = ?
C = 0.845M
V = 0.0179L

n = CV
= 0.845 x 0.0179
= $\underline{0.1512 \text{ mol}}$

$$n(I_2) = \frac{1}{2} \times n(S_2O_3{}^{2-})$$
$$= \frac{1}{2} \times 0.01512$$
$$= \underline{0.007562 \text{ mol}}$$

$$n(ClO^-) = n(I_2)$$

$$= \underline{0.007562 \text{ mol}}$$

$$n\,(ClO^-)_{in\ 100mL\ Vol\ Flask} = \frac{100}{25} \times n\,(ClO^-)_{in\ 25mL}$$

$$= \frac{100}{25} \times 0.007562$$

$$= \underline{0.03024\ mol}$$

NaC1O

$n = 0.03024$ mol

$m = ?$

$M = 74.5\ gmol^{-1}$

$m = nM$

$= 0.03024 \times 74.5$

$= \underline{2.253g}$

$$\therefore \%\ of\ (NaC1O)\ in\ bleach = \frac{2.253}{10} x\, 100$$

$$= 22.53$$

$$= \underline{22.5\%}$$