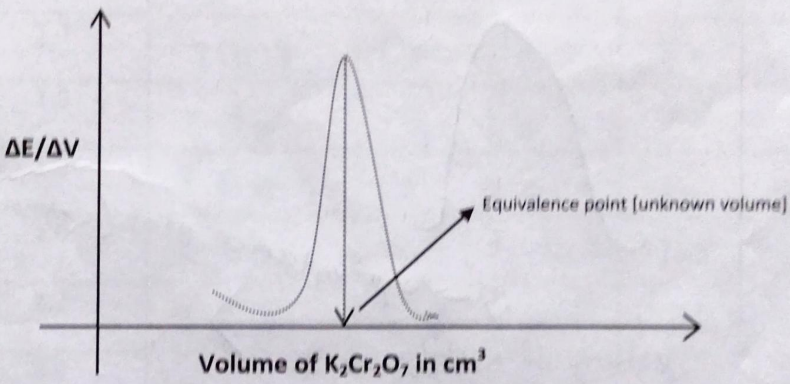
therefore, an abrupt increase in the potential is observed at the equivalence point. This increase marks the end point of the titration. Potential change at an electrode cannot be directly measured. The electrode at which the potential changes with concentration (indicator electrode) is connected to another electrode whose potential remains constant [ex:-calomel electrode (Standard reference electrode)], to form a cell. $EMF = E_{cathode} - E_{anode}$. As the potential of the indicator electrode changes, the EMF of the cell also changes. It is the change in EMF that is measured during a potentiometric titration.

Description:

Pipette out 25 cm^3 of Ferrous ammonium sulphate solution in to a clean beaker. Add 1 test tube of dil. Sulphuric acid. Dip the electrode assembly into the solution and connect to a potentiometer. Measure the potential. Add 0.2 cm^3 of Potassium dichromate from a burette. Stir the solution well and measure the potential. Continue the process till the potential shows a tendency to increase rapidly. Now add dichromate in increments of 0.2 cm^3 and measure the potential after each addition. Plot a graph of $\Delta E/\Delta V$ against volume of dichromate added as shown in the figure and find out the end point. Calculate the normality of the ferrous solution and determine the amount of iron in the given volume.



Calculation:

Volume of $K_2Cr_2O_7$ required for the reaction= Vcm^3 (From graph), $N_{FAS} = \frac{(NV)\ K_2Cr_2O_7}{V_{FAS}}$

($N_{FAS} = N_{Iron}$)

Amount of iron presented in 1000 cm^3 of its solution $= N_{FAS}$ x gram equivalent weight of Iron = ...B g

Model Procedure /Flow Chart: • Pippette out 25cm³ of ferrous ammonium sulphate in a clean beaker

• Add 1 test tube of dilute sulphuric acid.

• Fill the burette with Potassium dichromate.

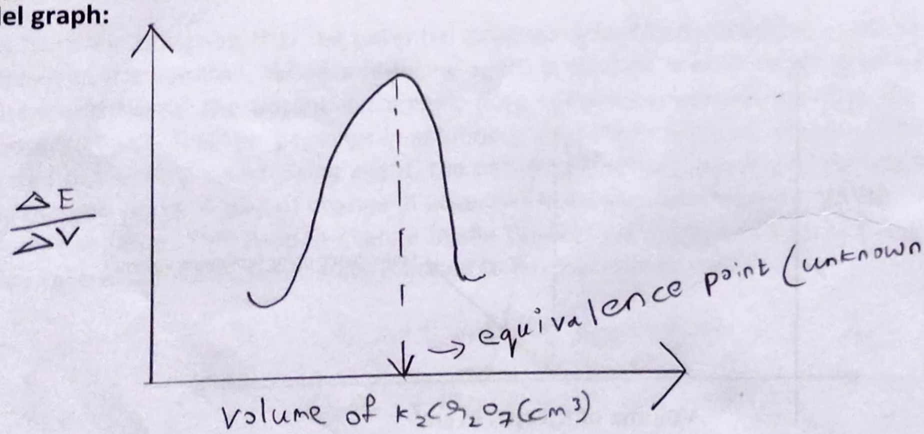
• ~~Take~~ Dip the glass and platinum electrodes and take the reading ~~with~~ from potentiometer

• Add 0.2cm³ $K_2Cr_2O_7$ and take readings.

• Plot a graph of ΔE against ΔV to find out end point

- Take the reading
- Continue ~~taking~~ adding 0.2 cm^3 of $K_2Cr_2O_7$ and take the readings.
- plot a graph of ΔE against volume of $K_2Cr_2O_7$ added and find out the end point
- Then calculate the normality of given ferrous solution and then find amount of iron in given volume.

Model graph:



Model Calculation:

volume of $K_2Cr_2O_7$ required f.r reaction = V cm^3

$$N_{FAS} = \frac{(NV)_{K_2Cr_2O_7}}{V_{FAS}}$$ (N_{iron} =

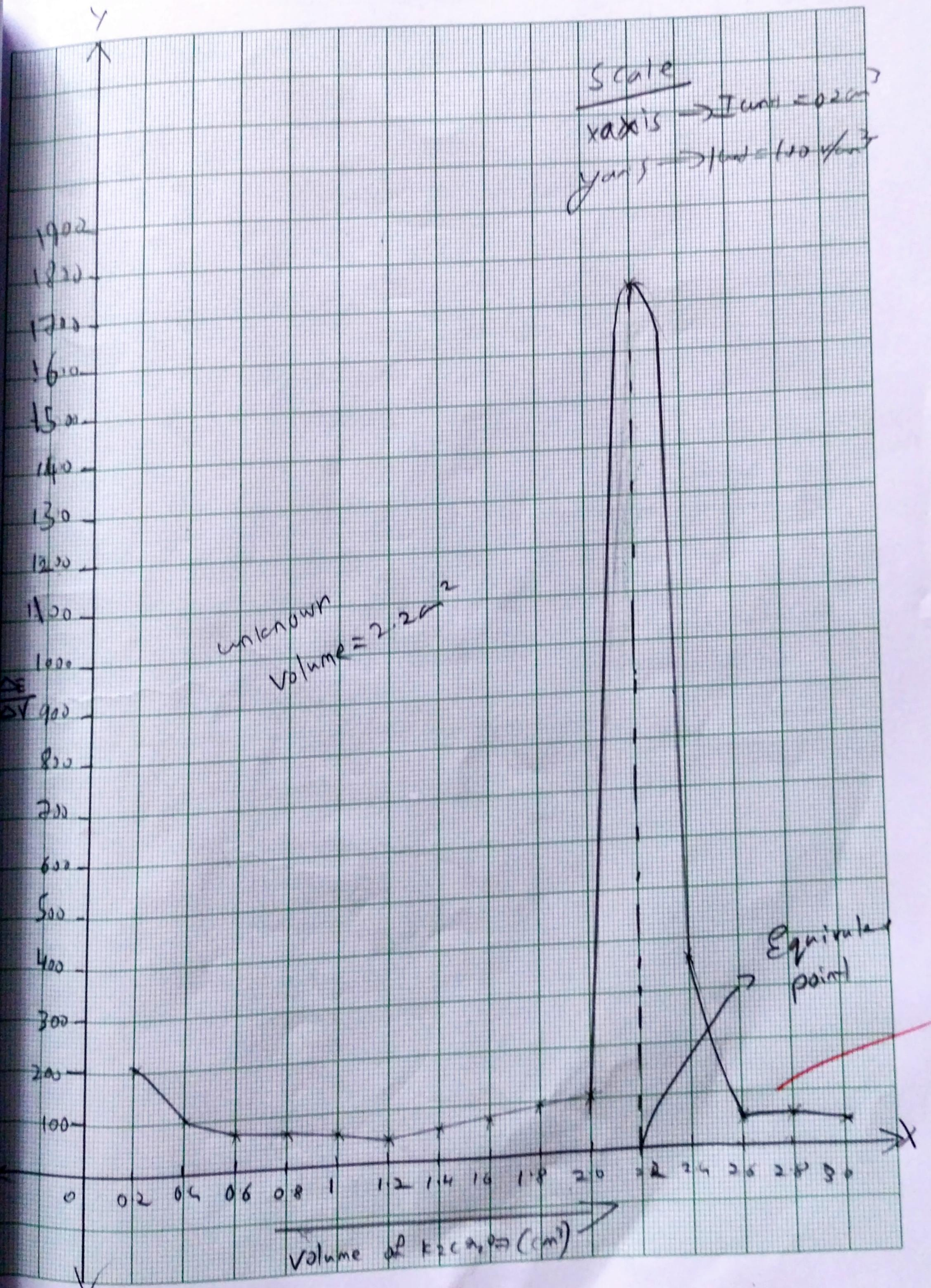
Amount of iron present in 1000 ml of its solution

is = N_{FAS} × gram equivalent weight of iron

= N_{FAS} × 55.85

Tabulation:

Volume of $K_2Cr_2O_7$ added in cm^3	Potential (E) In mV	ΔE	ΔV	ΔE/ΔV
0.0	230	–	–	
0.2	271	41	0.2	205
0.4	292	~~31~~21	0.2	105
0.6	306	14	0.2	~~138~~70
0.8	319	13	0.2	65
1.0	331	12	0.2	60
1.2	340	9	0.2	45
1.4	352	12	0.2	60
1.6	366	14	0.2	70
1.8	384	18	0.2	90
2.0	405	21	0.2	105
2.2	753	348	0.2	1740
2.4	825	72	0.2	360
2.6	835	10	0.2	50
2.8	846	11	0.2	55
3.0	855	9	0.2	45
3.2	862	7	0.2	35
3.4				
3.6				


Scale
x axis → 1 unit = 0.2 cm³
y axis → 1 unit = 100 v/cm³
unknown volume = 2.2 cm²
Equivalent point
Volume of $K_2Cr_2O_7$ (cm³)
$\frac{\Delta E}{\Delta V}$
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900

Calculation:

volume of $K_2Cr_2O_7$ required = equivalence point = 2.2

Normality of $K_2Cr_2O_7$ = $N_{K_2Cr_2O_7}$

volume of FAS = 25cm³

Normality of FAS = $\frac{(N \times V)_{K_2Cr_2O_7}}{V_{FAS}} = \frac{2.2 \times 0.0489}{25}$

N_{FAS} = 0.0043

Amount of Iron present in 1000cm³ of FAS = N_{FAS} × Gram eq. wt
= 0.0043 × 55.85 = 0.240295 = $\boxed{0.024g}$

Inference

- upto the equivalence point, the emf ~~Fe~~ potential produced is due to iron ions and after the ~~equilibrium~~ equivalence point the emf ~~m~~ produced is due to chromium ion.
- At equivalence point all Fe^{+3} ion are converted into Fe^{+2}

Relevance to Society & Environment:

- use of potentiometer ~~are~~ reduces use of indicator which reduces cost, saves resources and also reduces ~~one~~ waste.
- It is economically profitable to know % percentage use of FAS in particular substance

Report: Amount of Iron present in 1000 cm³ of FAS solution = 0.24 **g**

Evaluation of Experiment - 4		
Components	Marks	
	Max	Obtained
Model Procedure, Model Graph & Calculation	16	16
Equivalence Point & Execution	20	19
Inference & Societal Relevance	04	03
Total	40	38
Signature of Teacher	[signature]	