



EXPERIMENT NO. 3 (a)

Date :

STANDARDISATION OF KMnO_4

AIM OF THE EXPERIMENT : To determine the strength of KMnO_4 solution by using standard sodium oxalate solution.

APPARATUS REQUIRED

- | | | | |
|--------------------------------|-----------------------|------------------|------------------|
| 1. Burette | 2. Pipette | 3. Conical flask | 4. Burette Stand |
| 5. Marble sheet / Asbestos Pad | 6. Measuring cylinder | | |

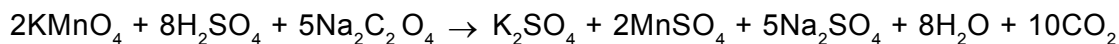
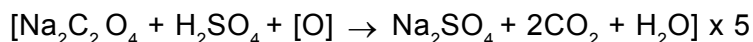
CHEMICALS REQUIRED

1. N/10 sodium oxalate ($\text{Na}_2\text{C}_2\text{O}_4$)
2. KMnO_4
3. H_2SO_4 (6N)

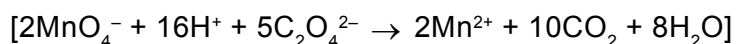
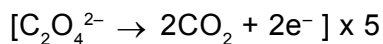
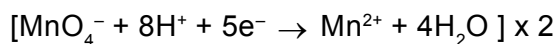
THEORY

When KMnO_4 is standardised against sodium oxalate in the presence of sulphuric acid, KMnO_4 oxidises oxalate ion into CO_2 while KMnO_4 gets reduced to MnSO_4 . Mn^{+7} is reduced to Mn^{+2} at a temperature of $60^\circ\text{--}70^\circ\text{C}$. The end point is detected when permanent pink colour develops in the solution.

CHEMICAL EQUATION



IONIC EQUATION





PROCEDURE :

1. Thoroughly wash the glassware with water.
2. Rinse the burette with supplied KMnO_4 solution and pipette with given sodium oxalate solution.
3. Fill the burette with the supplied KMnO_4 solution upto a convenient mark, Remove any air gap and note the initial burette reading.
4. Pipette out 10 ml of standard sodium oxalate solution into a conical flask and add approximately 10 ml of 6N H_2SO_4 to it.
5. Warm the solution upto 60°C to 70°C .
6. Carry out the titration by adding KMnO_4 solution from the burette till the colour changes from colourless to light pink. Note the final burette reading.
7. Repeat the process to get the concordant reading.

CALCULATION :

At the end point

$$N_1 V_1 = N_2 V_2$$

Where N_1 = Normality of KMnO_4 solution.

V_1 = Volume of KMnO_4 solution required for titration = V ml

N_2 = Normality of sodium oxalate solution (N/10)

V_2 = Volume of sodium oxalate solution required for titration = 10 ml

$$\text{So } N_1 = \frac{N_2 V_2}{V_1} = \frac{N}{10} \times \frac{10}{V}$$

$$\begin{aligned} \text{Strength of } \text{KMnO}_4 &= N_1 \times \text{Eq. wt. of } \text{KMnO}_4 \\ &= N_1 \times 31.6 = \dots\dots\dots \text{ g/l} \end{aligned}$$



Questions for Discussion.

1. What is redox titration ?
2. Which indicator is used in this experiment ?
3. What do you mean by primary standard and secondary standard ?
4. What do you mean by oxidation and reduction ?
5. What do you mean by oxidising agent and reducing agent ?
6. Why heating is necessary in the experiment ?
7. What is the colour change of KMnO_4 in acidic, alkaline and neutral medium titration ?
8. What is the equivalent weight of KMnO_4 in acidic, alkaline and neutral medium ?
9. Why KMnO_4 is added slowly in the titration ?
10. What is the equivalent weight of $\text{Na}_2\text{C}_2\text{O}_4$?

Rough Work



DEPARTMENT OF CHEMISTRY

Roll No. :

Branch :

Date :

AIM OF THE EXPERIMENT :

OBSERVATION TABLE

No. of Obs.	Vol. of $\text{Na}_2\text{C}_2\text{O}_4$ solution (ml)	Burette Reading (ml)		Difference V (ml)	Remark
		Initial	Final		
1.					
2.					
3.					
4.					



CALCULATION :

CONCLUSION :



EXPERIMENT NO. 3 (b)

Date :

ESTIMATION OF Fe^{2+}

AIM OF THE EXPERIMENT : To determine the amount of Ferrous (Fe^{2+}) ions present in the Mohr's salt solution by using standard KMnO_4 solution

APPARATUS REQUIRED

1. Burette
2. Pipette
3. Beaker
4. Conical flask
5. Burette Stand
6. Marble sheet / Asbestos Pad
7. Measuring cylinder

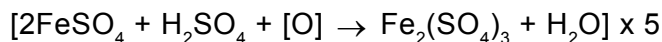
CHEMICALS REQUIRED

1. Standard KMnO_4 solution
2. Mohr's salt solution
3. H_2SO_4 (6N)

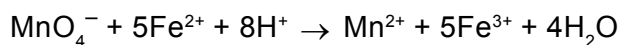
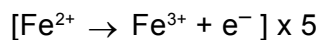
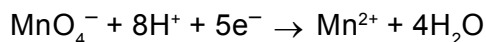
PRINCIPLE

To estimate the amount of ferrous (Fe^{2+}) ions in supplied Mohr's salt solution, it is titrated against a standard KMnO_4 solution. In the presence of H_2SO_4 , KMnO_4 oxidises ferrous ions to ferric ions, and it self get reduced to MnSO_4 i.e. Mn^{+7} reduced to Mn^{+2} . The end point is detected when a faint permanent pink colour is developed in the solution.

CHEMICAL EQUATION



IONIC EQUATION





PROCEDURE :

1. Thoroughly wash the glassware with water.
2. Rinse the burette with supplied KMnO_4 solution and pipette with the given Mohr's salt solution.
3. Fill the burette with the supplied standard KMnO_4 solution upto a convenient mark, remove any air gap and note the initial burette reading.
4. Pipette out 10 ml of Mohr's salt solution into a conical flask and add approximately 10ml of 6N H_2SO_4 to it by using a measuring cylinder.
5. Carry out the titration by adding KMnO_4 from the burette till the colour changes to light pink. Note the final burette reading.
6. Repeat the process to get the concordant reading.

CALCULATION :

At the end point

$$N_1 V_1 = N_2 V_2$$

Where N_1 = Normality of standard KMnO_4 solution.

V_1 = Volume of KMnO_4 solution required for titration.

N_2 = Normality of Mohr's salt solution.

V_2 = Volume of Mohr's salt solution required for titration.

$$\text{So } N_2 = \frac{N_1 V_1}{V_2}$$

Strength of Fe^{+2} ion in Mohr's salt solution

$$= N_2 \times \text{Eq. wt. of } \text{Fe}^{2+} \text{ in Mohr's salt}$$

$$= N_2 \times 55.85 = \dots\dots\dots \text{ g/l}$$



DEPARTMENT OF CHEMISTRY

Roll No. :

Branch :

Date :

AIM OF THE EXPERIMENT :

OBSERVATION TABLE :

No.of Obs.	Vol. of Mohr's salt solution (ml)	Burette Reading (ml)		Difference (ml)	Remark
		Initial	Final		
1.					
2.					
3.					
4.					



CALCULATION :

CONCLUSION :



Questions for Discussion.

1. Which is more stable between Fe^{2+} or Fe^{3+} and why ?
2. What are internal, external and self indicators ? Give one example of each.
3. Why KMnO_4 is not a primary standard ?
4. Why H_2SO_4 is used for acidification of KMnO_4 solution and not HCl or HNO_3 ?
5. Why ferrous sulphate is not used in titration instead of Mohr's salt ?
6. What is the formula of Mohr's salt ?
7. Which meniscus is to be seen in the burette containing KMnO_4 solution and why ?
8. Which indicator is used during standardization of KMnO_4 solution ?
9. What acts as catalyst in this reaction ?
10. Why KMnO_4 is coloured ?

Rough Work