

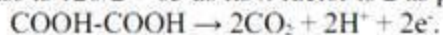
EXPERIMENT No. 1

AIM – (a) To prepare 100ml of M/20 solution of oxalic acid.

(b) Using this calculate the molarity and strength of the given KMnO_4 solution.

APPARATUS AND CHEMICALS REQUIRED- Oxalic acid, weighing bottle, weight box, volumetric flask, funnel, distilled water, chemical balance, beakers, conical flask, funnel, burette, pipette, clamp stand, tile, dilute H_2SO_4 , KMnO_4 solution.

THEORY- (a) Oxalic acid is a dicarboxylic acid having molar mass 126gmol^{-1} . It is a primary standard and has the molecular formula $\text{COOH-COOH} \cdot 2\text{H}_2\text{O}$. Its equivalent mass is $126/2 = 63$ as its n factor is 2 as per the following reaction:



Calculation of amount of oxalic acid to be weighed to prepare 100ml M/20 solution:

$$M = \frac{\text{wt. X } 1000}{\text{Mol. Wt } V(\text{ml})}$$

PROCEDURE:

1. Weigh a clean dry bottle using a chemical balance.
2. Add more weights to the pan containing the weights for the weighing bottle.
3. Add oxalic acid in small amounts to the weighing bottle, so that the pans are balanced.
4. Remove the weighing bottle from the pan.
5. Using a funnel, transfer the oxalic acid to the volumetric flask.
6. Add a few drops of distilled water to dissolve the oxalic acid.
7. Make up the volume to the required level using distilled water.
8. The standard solution is prepared.

(b) **THEORY-**

1. The reaction between KMnO_4 and oxalic acid is a **redox reaction** and the titration is therefore called a **redox titration**.
2. Oxalic acid is the reducing agent and KMnO_4 is the oxidizing agent.
3. KMnO_4 acts as an oxidizing agent in all the mediums; i.e. acidic, basic and neutral medium.
4. KMnO_4 acts as the strongest oxidizing agent in the acidic medium and therefore dil. H_2SO_4 is added to the conical flask before starting the titration.
5. The titration between oxalic acid and KMnO_4 is a slow reaction, therefore heat the oxalic acid solution to about 60°C to increase the rate of the reaction.
- 6.

IONIC EQUATIONS INVOLVED:

Reduction Half: $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$] X 2

Oxidation Half: $\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{CO}_2 + 2\text{e}^-$] X 5

Overall Equation: $2\text{MnO}_4^- + 16\text{H}^+ + 5\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$

INDICATOR- KMnO_4 acts as a self indicator.

END POINT- Colourless to light pink (KMnO_4 in the burette)

PROCEDURE-

1. Fill the burette with KMnO_4 solution.
2. Pipette out 10ml. of oxalic acid solution into the conical flask.
3. Add half a test tube of dil. H_2SO_4 and heat the solution to about 60°C to increase the rate of the reaction.
4. Keep a glazed tile under the burette and place the conical flask on it.
5. Note down the initial reading of the burette.
6. Run down the KMnO_4 solution into the conical flask drop wise with shaking.
7. Stop the titration when a permanent pink colour is obtained in the solution.
8. This is the end point. Note down the final burette reading.
9. Repeat the experiment until three concordant values are obtained.

OBSERVATION TABLE: (TO BE PUT UP ON THE BLANK SIDE USING A PENCIL)

Volume of Oxalic Acid solution taken =

S.No	BURETT	READINGS	VOLUME OF KMnO_4 USED (ml)
	E		
	INITIAL	FINAL	
1			
2			
3			
4			
5			

Concordant Value =

CALCULATIONS: (TO BE PUT UP ON THE BLANK SIDE USING A PENCIL)

Using formula:

$$N_1 M_1 V_1 = N_2 M_2 V_2$$

Where $N_1=5$ (for KMnO_4), $V_1=$, $M_1=?$

$N_2=2$ (for oxalic acid), $V_2=10\text{ml}$, $M_2=$

Strength = $M \times \text{Molar Mass}$.

RESULT- (ON RULED SIDE)- The Molarity of $\text{KMnO}_4 =$
And the strength of $\text{KMnO}_4 =$