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 COOH-COOH.$2H_2O$. Its equivalent mass is 126/2 = 63 as its *n* factor is 2 as per the following reaction:

$COOH\text{-}COOH \rightarrow 2CO_2 + 2H^+ + 2e^-$.

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

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

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 60^0C to increase the rate of the reaction.
6.

IONIC EQUATIONS INVOLVED:

Reduction Half: $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O] \times 2$

Oxidation Half: $C_2O_4^{2-} \rightarrow 2CO_2 + 2e^-] \times 5$

Overall Equation: $2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

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 60^0C 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	BURETTE READINGS		VOLUME OF $KMnO_4$
	INITIAL	FINAL	USED (ml)
1			
2			
3			
4			
5			

Concordant Value =

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

Using formula:

$N_1M_1V_1 = N_2M_2V_2$

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

N_2=2 (for oxalic acid), V_2= 10ml, M_2 =

Strength = M X Molar Mass.

RESULT- ***(ON RULED SIDE)***- The Molarity of $KMnO_4$ =

And the strength of $KMnO_4$ =