

09/2018 EXPERIMENT NUMBER: 13

STANDARDISATION OF $KMnO_4$ USING 0.085 M OXALIC ACID.

→ AIM:

To standardise the given $KMnO_4$ using $\frac{M}{40}$ oxalic acid solution.

→ APPARATUS REQUIRED:

Burette, pipette, standard flask, conical flask, funnel, glass rod.

→ CHEMICALS REQUIRED:

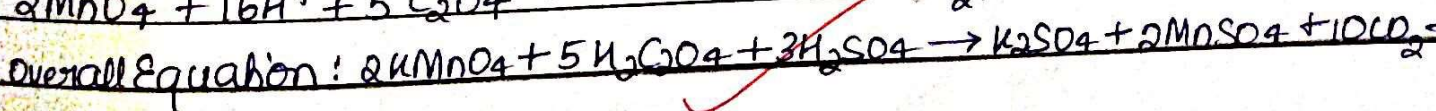
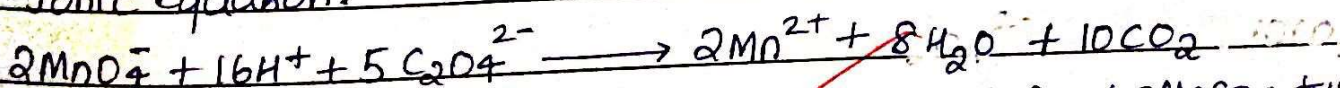
oxalic acid, $KMnO_4$ solution, 4N H_2SO_4 .

→ PRINCIPLE:

1. This is an example of a redox reaction.
2. Acidified $KMnO_4$ is the oxidising agent.
3. Oxalic acid is the reducing agent.
4. $KMnO_4$ is the self-indicator.
5. End point is the colour change from colourless to permanent pink.
6. During the reaction, the oxidation state of Mn changes from +7 to +2. The oxidation state of C changes from +3 to +4.
7. $KMnO_4$ is in the burette and oxalic acid is in the conical flask. To be added by the pipette.

→ EQUATION:

Ionic Equation:



→ PROCEDURE:

1. Prepare a standard solution of 0.025 M oxalic acid by accurately weighing 0.7875g of oxalic acid using a chemical balance.
2. Fill the burette with KMnO_4 after rinsing well.
3. Pipette out 20ml of oxalic acid from the standard flask to the conical flask.
4. Add 1 test tube full of 4N H_2SO_4 into the oxalic acid solution of the conical flask.
5. Heat the solution in the conical flask to 60-70°C.
6. Titrate the hot solution of oxalic acid against the KMnO_4 till end point is reached [colourless to permanent pink].

→ RESULT:

1. Molarity of $\text{KMnO}_4 = 0.0102 \text{ mol L}^{-1}$.
2. Strength of $\text{KMnO}_4 = 1.611 \text{ g L}^{-1}$.

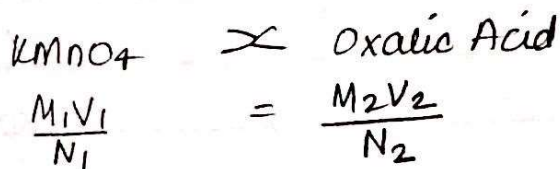
→ PRECAUTIONS:

1. The burette and pipette must be washed well.
2. For colourless solution, lower meniscus must be considered while for coloured solutions, upper meniscus must be considered while measuring the level of liquid.

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→ OBSERVATION AND CALCULATION:

SR. No.	Initial Burette Reading	Final Burette Reading	Volume of $KMnO_4$ (mL)	Volume of Oxalic acid
1.	0	19.5	19.5	20
2.	0	19.5	19.5	20.



$M_1 = \text{Molarity of } KMnO_4 = ?$

$V_1 = \text{Volume of } KMnO_4 = 19.5 \text{ mL}$

$N_1 = \text{No. of mols of } KMnO_4 = 2$

$M_2 = \text{Molarity of Oxalic Acid} = \frac{M}{40} = 0.025$

$V_2 = \text{Volume of oxalic acid} = 20 \text{ mL}$

$N_2 = \text{No. of mols of oxalic acid} = 5$

$$M_1 = \frac{M_2 V_2 N_1}{N_2 V_1}$$

$$M_1 = \frac{0.025 \times 20 \times 2}{5 \times 19.5}$$

$$M_1 = 0.0102$$

Strength or wt/litre of $KMnO_4$:

$$M = \frac{Wt}{M_r \times V} \implies \frac{Wt}{V} = M \times M_r$$

$$\begin{aligned} \text{Strength} &= 0.0102 \text{ mol L}^{-1} \times 158 \text{ g L}^{-1} \\ &= 1.611 \text{ g L}^{-1} \end{aligned}$$