

EXPT NO 2

ESTIMATION OF POTASSIUM PERMANGANATE

USING STANDARD OXALIC

ACID

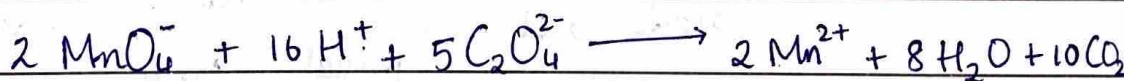
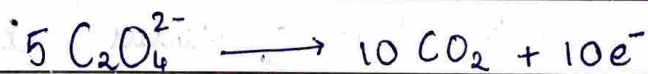
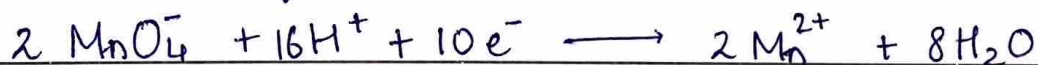
AIM:

To estimate the strength and molarity of the given potassium permanganate $[KMnO_4]$ using standard $M/50$ oxalic acid $[(COOH)_2 \cdot 2H_2O]$ solution.

PRINCIPLE:

Potassium permanganate reacts with oxalic acid solution at $60^\circ - 70^\circ C$

Ionic chemical equation involved:



PROCEDURE:

Weigh 0.63 grams of oxalic acid and dissolve it in 250 ml of water and prepare

$M/50$ solution of oxalic acid using 250ml standard volumetric flask.

The burette is washed with water and rinsed with $KMnO_4$ and filled upto zero mark.

The pipette is washed with water and rinsed with oxalic acid and each of the 20ml is pipetted out in a clear conical flask.

The titration flask is heated at 60° - 70° C and titrated against KMnO_4 taken in burette.

The end point is the appearance of permanent pale pink colour.

The titrations are repeated to get the concordant value.

RESULT:

The molarity of KMnO_4 is 0.0180 M

The strength of KMnO_4 is 2.844 g/l

~~Q.2~~



SHORT PROCEDURE :

- 1) Titrant [burette solution] = Potassium permanganate
- 2) Titrant [pipette solution] = Standard oxalic
- 3) Other reagent added = One test tube full of dil. H_2SO_4
- 4) Temperature = $60 - 70^\circ C$
- 5) Indicator = Self indicator [$KMnO_4$]
- 6) End point = Appearance of permanent pale pink colour
- 7) Molecular mass of potassium permanganate = 158 g/mol

CALCULATIONS

Weight calculations

$$1 \text{ Molar oxalic acid contains} = 126 \text{ g/L}$$

$$1/50 \text{ Molar oxalic acid contains} = 126/50 \text{ gL}^{-1}$$

$$1/50 \text{ Molar oxalic acid contains } \left. \begin{array}{l} \text{in } 250 \text{ ml} \end{array} \right\} = \frac{126 \times 250}{50 \times 1000}$$

$$= 0.63 \text{ g}$$

WEIGHING PROCEDURE

- * weight of the weighing bottle = 24.9 g
- * weight of the weighing bottle + oxalic acid = 25.53 g
- * weight of oxalic acid = 0.63 g
- * Volume of oxalic acid solution prepared = 250 ml
- * Molarity of 1/50 oxalic acid solution = 0.02 M
- * Volume of oxalic acid solution taken per titration = 20 ml

OBSERVATION:

S.No	Vol. of standard oxalic acid (ml)	Burette reading (ml)		Vol. of $KMnO_4$ consumed (ml)	Concordant value
		Initial	Final		
1.	20	0	22.2	22.2	
2.	20	0	22.2	22.2	22.2
3.	20	0	22.1	22.1	

DETERMINATION OF MOLARITY OF KMnO_4 SOLUTION:

NOTE: (i) 1 - indicator KMnO_4
2 - indicator oxalic acid

VOLUMETRIC FORMULA: $V_1 M_1 n_1 = V_2 M_2 n_2$

$$V_1 = \text{Volume of } \text{KMnO}_4 = 22.2 \text{ ml}$$

$$M_1 = \text{Molarity of } \text{KMnO}_4 = 0.0180 \text{ M}$$

n_1 = Number of electrons gained by KMnO_4

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

$$M_2 = \text{Molarity of oxalic acid} = 0.02 \text{ M}$$

n_2 = Number of electrons lost by oxalic acid

$$M_1 = \frac{V_2 \times M_2 \times n_2}{V_1 \times n_1} = \frac{20 \times 0.02 \times 2}{22.2 \times 1} = \frac{0.4}{22.2}$$

$$M_1 = 0.0180 \text{ M}$$

Amount of KMnO_4 per litre solution is

= molarity of KMnO_4 \times molecular mass of KMnO_4

$$= 0.0180 \text{ M} \times 158 \text{ g/mol}$$

$$= 2.844 \text{ g/l}$$