

2013 EXPERIMENT NUMBER: 11

STANDARDISATION OF  $KMnO_4$  USING 0.05M MOHR'S SALT SOLUTION.

→ AIM:

To standardise the given  $KMnO_4$  using 0.05M Mohr's salt solution.

→ APPARATUS REQUIRED:

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

→ CHEMICALS REQUIRED:

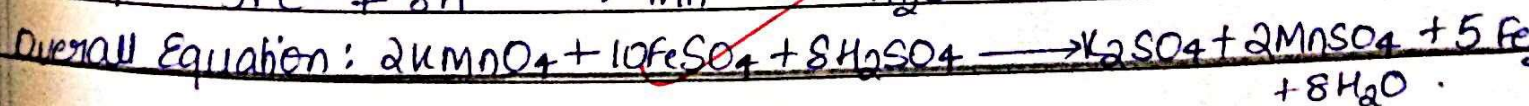
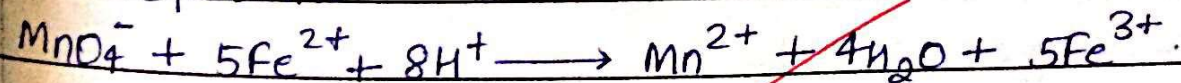
Mohr's salt,  $KMnO_4$ , 4N  $H_2SO_4$ , distilled water.

→ PRINCIPLE:

1. This is an example of a redox reaction.
2. Acidified  $KMnO_4$  is the oxidising agent.
3. Mohr's salt 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 Fe changes from +2 to +3.
7.  $KMnO_4$  is in the burette and Mohr's salt is in the conical flask taken by the pipette.

→ EQUATION:

Ionic Equations:



→ PROCEDURE:

1. Standard solution of 0.05M Mohr's salt is prepared accurately by weighing 4.9g of Mohr's salt using a chemical balance.
2. Rinse the burette with water and then with  $\text{KMnO}_4$ .
3. Fill up the burette with  $\text{KMnO}_4$ .
4. Rinse the pipette with Mohr's salt solution. Pipette out 20ml of Mohr's salt solution. Transfer it into the conical flask.
5. Add 10ml of 9N  $\text{H}_2\text{SO}_4$  into the conical flask to make the medium acidic.
6. Titrate Mohr's salt solution against  $\text{KMnO}_4$  solution till end point is reached.
7. Note down the initial burette reading and the final burette reading.
8. Repeat the titration till you get concordant value.

→ 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 or pipette must be washed well.
2. For colourless solutions, lower meniscus must be checked while for coloured solutions, upper meniscus must be considered while measuring the level.

30/10/14

→ CALCULATION:

Standardisation of  $\text{KMnO}_4$ .

SR. No.	Initial Burette Reading	Final Burette Reading	Volume of $\text{KMnO}_4$ (mL)	Volume of Mohr's Salt Sol <sup>n</sup> (mL)
1.	0	19.5	19.5	20
2.	0	19.5	19.5	20

$$\text{KMnO}_4 \quad \times \quad \text{Mohr's Salt}$$
$$\frac{M_1 V_1}{N_1} = \frac{M_2 V_2}{N_2}$$

$$M_1 = \text{Molarity of } \text{KMnO}_4 = ?$$

$$V_1 = \text{Volume of } \text{KMnO}_4 \text{ used} = 19.5 \text{ mL}$$

$$N_1 = \text{No. of moles of } \text{KMnO}_4 = 1$$

$$M_2 = \text{Molarity of Mohr's Salt} = 0.05 \text{ M}$$

$$V_2 = \text{Volume of Mohr's Salt used} = 20 \text{ mL}$$

$$N_2 = \text{No. of moles of Mohr's Salt} = 5$$

$$M_1 = \frac{M_2 V_2 N_2}{N_2 V_1} = \frac{0.05 \times 20 \times 1}{5 \times 19.5}$$

$$M_1 = 0.0102 \text{ mol L}^{-1}$$

Strength or wt/ditre of  $\text{KMnO}_4$ :

$$\text{Strength} = M \times \text{Molar mass}$$

$$= 158 \text{ g mol}^{-1} \times 0.0102 \text{ mol L}^{-1}$$

$$= \underline{\underline{1.6116 \text{ g L}^{-1}}}$$