Aim: To determine the strength in g/L of the given unknown Mohr's salt solution by titrating against potassium permanganate solution.

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Requirements:

Apparatus: Burette, pipette, conical flask, standard flask, beaker, spatula wash bottle, weighing bottle etc.

Chemicals:

Mohr's salt, $KMnO_4$ solution, dilute H_2SO_4

Theory:

$$\overset{+7}{MnO_4^-} + 8H^+ \longrightarrow Mn^{2+} + 4H_2O \quad \times 1$$

Change in O.S = 5

$$Fe^{2+} \longrightarrow Fe^{2+} \quad \times 5$$

Change in O.S = 1

$$MnO_4^- + 8H^+ + 5Fe^{2+} \longrightarrow Mn^{2+} + 4H_2O + 5Fe^{2+}$$

Pink → Colourless

Equivalent weight of Mohr's salt:

$(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$

Molecular weight = 392.14

$$Fe^{2+} \longrightarrow Fe^{3+}$$

Change in O.S. = 1

Equivalent weight of Mohr's salt = $\frac{\text{Molecular weight}}{1}$

$= \frac{392.14}{1}$

Equivalent Weight of Mohr's salt = 392.14

Preparation of 4N H_2SO_4:

$$N = \frac{10 \times x \times d}{E}$$

where N = normality of the acid
x = Percentage composition
d = Specific gravity or density of the given acid

Preparation of $\frac{N}{40}$ Mohr's salt: (100mL)

Given the $N = \frac{1}{40}$

V = 100 mL

Equivalent weight of Mohr's salt = 392.14

w = ?

$$\text{Normality} = \frac{\text{weight} \times 1000}{\text{Equivalent wt.} \times V}$$

$$\frac{1}{40} = \frac{w}{392.14} \frac{\times 1000}{100}$$

$$w = \frac{392.14}{400} g$$

w = 0.98 g

Procedure:

1. **Preparation of standard solution of Mohr's salt:**
Prepare a standard solution of Mohr's salt by dissolving 0.98 g Mohr's salt in 4N H_2SO_4 (10mL) and make up to the mark with distilled water in a 100 mL standard flask.

2. **Standardisation of $KMnO_4$ with Known Mohr's salt solution:**
Pipette out 10 mL of the standard solution of Mohr's salt in a conical flask, add 10mL 4N H_2SO_4 and titrate with $KMnO_4$ solution till permanent light pink colour is obtained. Repeat the titration till three concordant readings are obtained.

3. Titration of unknown Mohr's salt solution with standard $KMnO_4$.
Similar to step 2.

Calculations:

Strength = Normality × Equivalent wt. g/L

= Normality × 392.14 g/L