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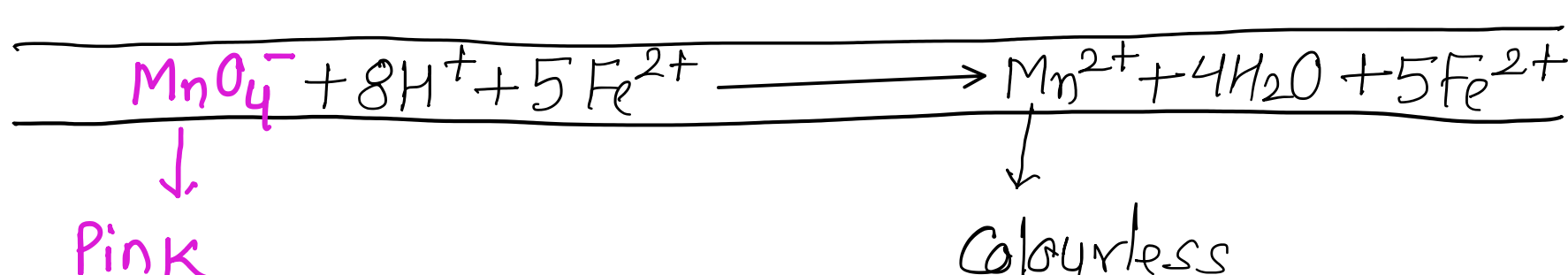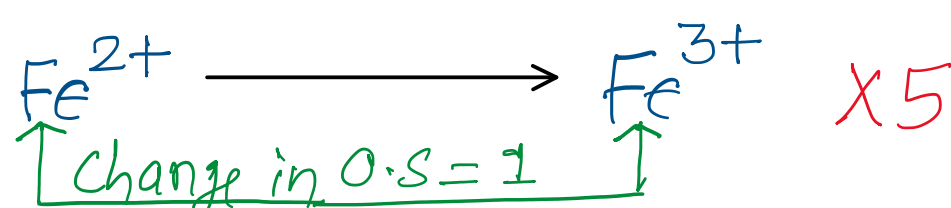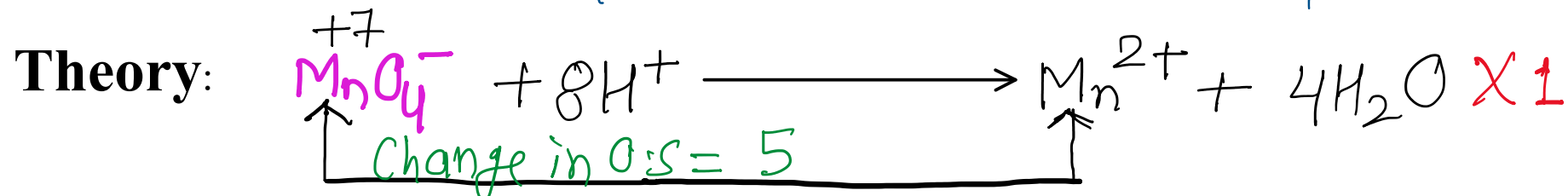
Requirements:

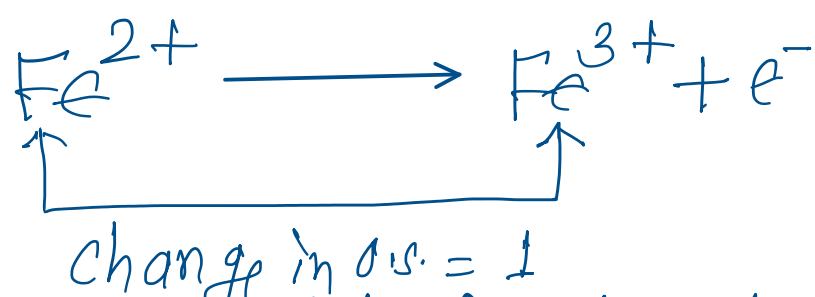**Apparatus:** Burette, pipette, conical flask, standard flask, beaker, spatula, wash bottle, weighing bottle etc.

Chemicals:

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

Theory:

$$\overset{+7}{Mn}O_4^- + 8H^+ \longrightarrow \overset{2+}{Mn} + 4H_2O \quad \text{X1}$$

Change in o.s = 5

$$\overset{2+}{Fe} \longrightarrow \overset{3+}{Fe} \quad \text{X5}$$

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 $= 392.14$

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

change in o.s = 1

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

$$= \dfrac{392.14}{1}$$

Equivalent weight of Mohr's salt = 392.14

Preparation of 4N H_2SO_4:

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

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 $N = \dfrac{1}{40}$

$V = 100$ mL

Equivalent weight of Mohr's salt $= 392.14$

$w = ?$

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

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

$$w = \dfrac{392.14}{400} \text{ g}$$

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