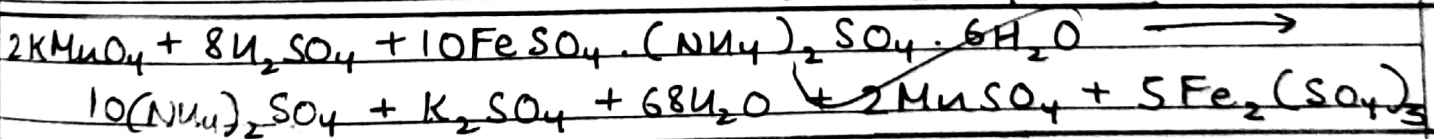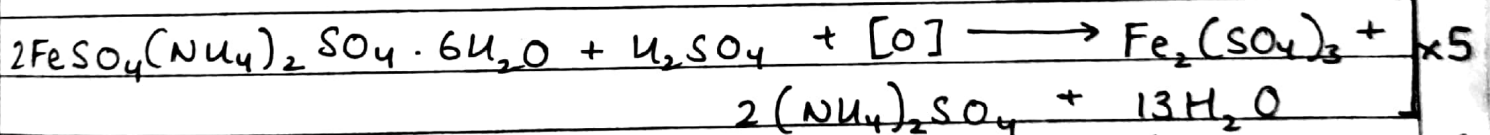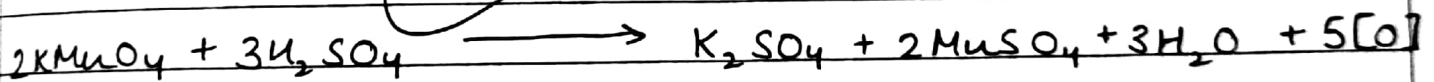# Volumetric analysis

Aim : (i) To prepare 250 ml of $M/10$ Moher's salt solution (ferrous amm. sulphate)

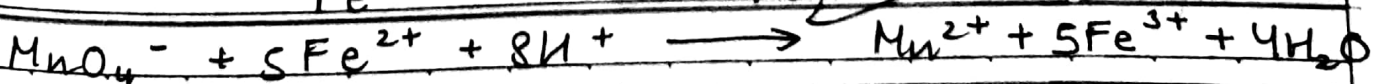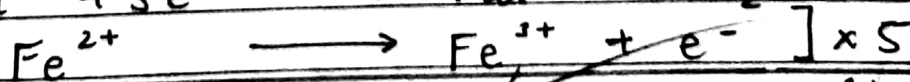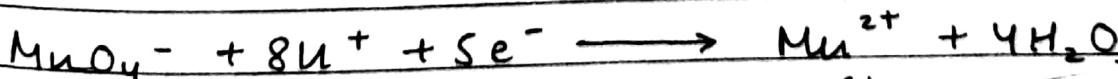(ii) Using this sol^n find out the molarity and strength of given $KMnO_4$ solution.

Apparatus Required : Watch glass, 250 ml conical flask, pipette funnel, weighting machine, titration flask, burette stand.

Chemicals Required : Moher salt, water, conc. H_2SO_4, dil. H_2SO_4, $KMnO_4$.

Theory : Redox titration
Molecular equations

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

$$2FeSO_4(NH_4)_2SO_4 \cdot 6H_2O + H_2SO_4 + [O] \longrightarrow Fe_2(SO_4)_3 + \left] \times 5 \right.$$
$$2(NH_4)_2SO_4 + 13H_2O$$

$$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O \longrightarrow$$
$$10(NH_4)_2SO_4 + K_2SO_4 + 68H_2O + 2MnSO_4 + 5Fe_2(SO_4)_3$$

Ionic equations

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$$
$$\left. Fe^{2+} \longrightarrow Fe^{3+} + e^- \right] \times 5$$
$$MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

Teacher's Signature _____

Burette : 50 ml = $KMnO_4$ = oxidising agent
Pipette : 10 ml = Mohr salt = reducing agent
End point : From colorless to very light pink permanent pink color
Indicator : $KMnO_4$ = self - indicator

Procedure
Preparation of 250 ml of M/10 Mohr salt solution

$$Molarity = \frac{no. \text{ of moles of Mohr salt}}{Vol. \text{ of solution in litres}}$$

$$M = \frac{mass \text{ of Mohr salt}}{molar \text{ mass of Mohr salt}} \times \frac{1000}{V_{soln} (ml)}$$

$$\frac{1}{10} = \frac{w}{392} \times \frac{1000}{250}$$

$$w = 9.8 \text{ g}$$

Weight of empty watch glass = 22 g
Weight of watch glass + Mohr salt = 31.8 g
weight of Mohr salt = 9.8 g

1) Transfer the weighed Mohr salt from watch glass into a clean 250 ml measuring flask using a funnel.
2) Wash the watch glass and funnel with distilled water to transfer the particles sticking to it into the measuring flask and add 2-3 ml of conc H_2SO_4 to it.

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3) Swirl the measuring flask till solid Mohr salt dissolves.
4) Add enough water just upto 250 ml.
5) Clamp a rinsed burette on burette stand.
6) Pipette 10 ml of Mohr salt sol^n in a titration flask. Add add 1 full test tube (10ml) of dil. H_2SO_4 to it.
7) Place the titration flask under the nozzle of burette.
8) Note the initial reading of burette and run out the solution.
9) Stop addition of the sol^n when the end point is reached. Note the reading.
10) Repeat the steps till three concordant readings.

Observation Table

S.No	Initial redding of burette	Final reading of burette	Volume of $KMnO_4$ used.
1.	O	10	10 ml
2.	10	20·1	10·1 ml
3.	20·1	30·1	10 ml
4.	30·1	40·1	10 ml

CONCORDANT VOLUME = __10__ ml

Calculation

formula used ; $a_1 M_1 V_1 = a_2 M_2 V_2$
              (mohr salt)   ($KMnO_4$)

$$1 \times \frac{1}{10} \times 10 = 5 \times M_2 \times 10$$

$M_2 = 0.02$ mol / L

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Expt. No. ____

moles of $KMnO_4$ sol^n = 0.02 mol/L

strength of $KMnO_4$ sol^n = M × molar mass of $KMnO_4$

$$= 0.02 \times 158$$

$$= 3.16 \ g/L$$

Result

molarity of given $KMnO_4$ is 0.02 mol/L

strength of given $KMnO_4$ is 3.16 g/L

Precautions

1) Wash the apparatus with water and rinse it with the given solution.

2) Burette scale reading and eye should be at same level.

3) Burette should be clamped vertically in the burette stand.

96/8

Neat work

keep it up.