1. You are provided with the following:

FA1 which is a solution made by dissolving 9.8g of ammonium ferrous sulphate, $(NH_4)_2\ SO_4\ FeSO_4.\ 6H_2O$ to make $250cm^3$ of solution.

FA2, which is a solution containing potassium managanate (VII) of unknown concentration.

Salt **T**, which is an impure metal persulphate, MS_2O_8.

2 M sulphuric acid.

You are required to determine the;

(i) molar concentration of poatassium managante (VII) in **FA2**.

(ii) percentage of purity of MS_2O_8 in **T**.

Manganate (VII) ions react with (II) ions in acid medium according to following equations;

$$MnO^-_{4\,(aq)} + 8H^+_{(aq)} + 5Fe^{2+}_{(aq)} \longrightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)} + 5Fe^{3+}_{(aq)}$$

Also persulphate ions react with Iron (II) ions in acid medium according to the following equation.

$$S_2O^{2-}_{8\,(aq)} + 2Fe^{2+}_{(aq)} \longrightarrow 2SO^{2-}_{4\,(aq)} + 2Fe^{3+}_{(aq)}$$

PART I.

PROCEDURE:

Pipette 25.0 (or 20.0) cm^3 of **FA1** into a conical flask. Add an equal volume of 2M Sulphuric and titrate the mixture with **FA2** until the end point.

Repeat the titration until you obtain consistent results.

Record your results in Table 1.

RESULTS:-

Volume of pipette used..25.00..... cm^3 (½ mark)

Table 1

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of FA2 used (cm^3)	16.50	16.40	16.40

(4½ marks)

(a) (i) Record the volumes of FA2 used for calculating the average volume.

.....cm^3 (½mark)

(ii)Calculate the average volume of FA2 used. (2 ½ mark)

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.....cm^3

(b)Calculate the;

(i) molarity of FA1 solution. (2 ½ marks)

(H =1 ; N = 14 ; S = 32; Fe = 56).

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(ii) molar concentration of manganate (VII) in FA2 solution. (2½marks)

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PART II

PROCEDURE:

Weigh accurately about 0.5 g of T and place it in a beaker shake. Add about 50cm^3 of distilled water and stir to dissolve. Transfer the contents of the beaker into 250cm^3 volumetric flask.

Add exactly 150cm^3 of FA1 and make up the solution to the mark by adding distilled water .Shake and allow to stand for about 5 minutes .Label the resultant solution FA3.

Pipette 25.0 (20.0) cm^3 of FA3 into a conical flask and add 10cm^3 of 2M sulphuric acid.

Titrate the mixture with FA2 until the end point.

Repeat the titration until you obtain consistent results.

Record your results in Table 2.

RESULTS.

Mass of T and weighing container.....g (½mark)

Mass of weighing container .....g (½mark)

Mass of T used .....g(½mark)

Volume of pipette used .....cm^3(½mark)

Table 2.

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of FA2 used (cm^3)	21.50	20.40	20.40

(4½ marks)

(a) (i) Record the volumes of **FA2** used for calculating average volume.

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.....cm^3 (½ mark)

(ii)Calculate the average of volume of **FA2**:

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..... cm^3 (2½ marks)

(b)Calculate the;

(i) the number of moles of excess Iron (II)ions that did not react with the persulphate in **T**. (2½ marks)

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(ii)the number of moles of iron(II) ions that reacted with persulphate ions in T. (02marks)

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(C)Determine the percentage of purity of MS_2O_8 in T . (3½ marks)

(M=24 ; S=32 ; O=16)

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