

1. You are provided with the following:

FA1 which is a solution made by dissolving 9.8g of ammonium ferrous sulphate,  $(\text{NH}_4)_2 \text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$  to make  $250\text{cm}^3$  of solution.

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

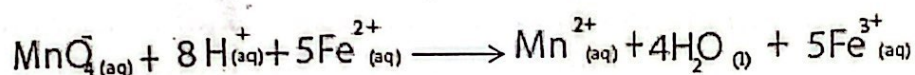
Salt T, which is an impure metal persulphate,  $\text{MS}_2\text{O}_8$ .

2 M sulphuric acid.

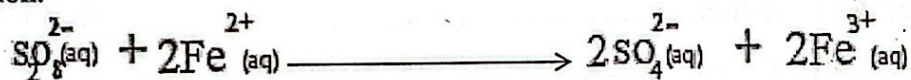
You are required to determine the;

- molar concentration of potassium manganate (VII) in FA2.
- percentage of purity of  $\text{MS}_2\text{O}_8$  in T.

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



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



## PART I.

### PROCEDURE:

Pipette  $25.0$  (or  $20.0$ )  $\text{cm}^3$  of FA1 into a conical flask. Add an equal volume of 2M Sulphuric acid 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<sup>3</sup> (½ mark)

Table 1

Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Volume of FA2 used (cm <sup>3</sup> )	16.50	16.40	16.40

(4½ marks)

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

.....cm<sup>3</sup> (½mark)

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

..... cm<sup>3</sup>

(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)

## PART II

### PROCEDURE:

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

Add exactly 150cm<sup>3</sup> 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<sup>3</sup> of FA3 into a conical flask and add 10cm<sup>3</sup> 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<sup>3</sup>(½mark)

Table 2.

Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Volume of FA2 used (cm <sup>3</sup> )	21.50	20.40	20.40

(4½ marks)



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

 $\text{cm}^3$  (½ mark)

(ii) Calculate the average of volume of FA2:

cm<sup>3</sup> (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)

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

(C) Determine the percentage of purity of  $\text{MS}_2\text{O}_8$  in T. (3½ marks)

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