EXPERIMENT NO. 7

2 In this experiment you will determine the value of x in the formula for hydrated manganese(II) sulfate, MnSO₄•xH₂O, where x is an integer. You will do this by measuring the mass lost when a sample of hydrated manganese(II) sulfate is heated.

$$MnSO_4 \cdot xH_2O(s) \rightarrow MnSO_4(s) + xH_2O(g)$$

FA 4 is hydrated manganese(II) sulfate, MnSO₄•xH₂O.

(a) Method

- Weigh the crucible with a lid and record the mass.
- Add all the **FA 4** to the crucible.
- Reweigh the crucible with the lid and FA 4. Record the mass. Describe the appearance of FA 4.

appearance of FA 4 Pale Pinh solid

- Place the crucible in the pipe-clay triangle on top of the tripod.
- Heat the crucible **gently** with the lid on for approximately 1 minute.
- Remove the lid and then heat more strongly for a further 4 minutes.
- Replace the lid and allow the crucible to cool.
- Once the crucible has cooled, reweigh the crucible with the lid and contents. Record the mass
- Calculate and record the mass of FA 4 added to the crucible, the mass of the residue and the mass of water lost.
- Describe the appearance of the residue.

appearance of the residue M- white SSid

mass of crucible + lid/g	46.21
mass of crucible + Lid + FA4/9	48.12
mass of crucible + lid + FA4 after heating/g	47.86
mass of FA4 added/g	1.91
mass of residue left/g	1.65
,	0.26

I	
II	
III	
IV	
V	
VI	

[6]

(b) Calculations

(i) Calculate the number of moles of manganese($\rm II$) sulfate present in the residue. You may assume all the water of crystallisation has been removed.

$$N = \frac{m}{M_Y}$$

$$= \frac{1.65}{151}$$

moles of MnSO₄ = 0.0109 mol [1]

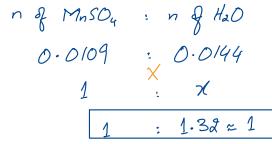
(ii) Calculate the number of moles of water lost.

$$n = \frac{m}{M_{\gamma}}$$

$$= \frac{0.26}{18}$$

moles of water lost = 0.0/44 mol [1]

(iii) Calculate the value of x in MnSO₄•xH₂O.



- (c) It is possible that FA 4 did not lose all of the water of crystallisation in your experiment.
 - (i) Explain how you could modify the experiment to ensure all water has been removed.

Reheat the contexts to get constant max.

(ii) Explain why your calculated value of x might not change if a small amount of water of crystallisation remained in the residue.

The changes in masses will be too small to change the integer value of x. [1]

[Total: 11]