# EXPERIMENT NO. 7

**2** In this experiment you will determine the value of x in the formula for hydrated manganese(II) sulfate, $MnSO_4 \cdot xH_2O$, 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, $MnSO_4 \cdot xH_2O$.

**(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** .....

- 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 .....

| | |
|---|---|
| I | |
| II | |
| III | |
| IV | |
| V | |
| VI | |

[6]

**(b) Calculations**

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

moles of $MnSO_4$ = ..... mol [1]

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

moles of water lost = ..... mol [1]

**(iii)** Calculate the value of x in $MnSO_4 \cdot xH_2O$.

x = ..... [1]

**(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.

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..... [1]

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

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..... [1]

[Total: 11]