EXPERIMENT NO. 1

In this question you will use a method involving measuring masses. You will find the identity of a Group 2 element, **Y**, whose hydrated sulfate has the formula $YSO_4.7H_2O$.

When heated, the hydrated sulfate loses its water of crystallisation to form anhydrous sulfate. The anhydrous sulfate does not decompose at the temperature of the Bunsen flame.

$$YSO_4.7H_2O(s) \rightarrow YSO_4(s) + 7H_2O(g)$$

FA 4 is the hydrated sulfate of **Y**, $YSO_4.7H_2O$.

(a) Method

- Weigh the crucible with its lid and record the mass.
- Tip between 1.80 g and 2.00 g of **FA 4** into the crucible.
- Weigh and record the mass of crucible, lid and **FA 4**.
- Place the crucible on the pipe-clay triangle on the tripod. Put the lid on the crucible and heat gently for about 1 minute.
- Use tongs to remove the lid and heat the crucible strongly for about 4 minutes. Replace the lid and then leave to cool.
- When cool, reweigh the crucible with its lid and contents and record the mass.
- Calculate and record the mass of **FA 4** before heating, the mass of residue after heating and the mass of water lost.

[4]

(b) Calculations

  (i) Calculate the number of moles of water lost on heating **FA 4**.

moles of H_2O lost = ... mol [1]

  (ii) Deduce the number of moles of anhydrous **Y**SO_4 that are formed when this water is lost.

moles of **Y**SO_4 = ... mol [1]

  (iii) Use your answer to **(ii)** and the mass of residue left after heating **FA 4** to determine the relative atomic mass, A_r, of **Y**.

A_r of **Y** = ... [2]

  (iv) Identify **Y**.

Y is .... [1]

(c) A student did not heat the sample of **FA 4** for long enough to remove all the water.

What would be the effect of this on the calculated value of the relative atomic mass of **Y**?

Explain your answer.

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....

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.... [2]

[Total: 11]