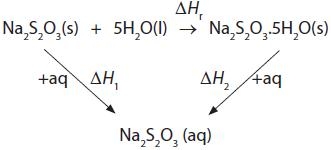
**Q13.**

The enthalpy change for the reaction to form hydrated sodium thiosulfate crystals cannot be measured directly.

The following Hess cycle can be used.



The enthalpy change for the reaction, Δ*H*r, is equal to

   **A**     Δ*H*1     +   Δ*H*2

   **B**     Δ*H*1     −   Δ*H*2

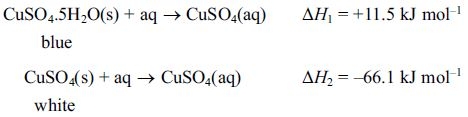
   **C**     −Δ*H*1   −   Δ*H*2

   **D**     −Δ*H*1   +   Δ*H*2

**(Total for question = 1 mark)**

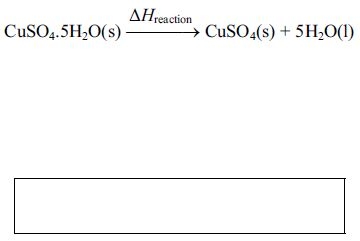
**Q8.**

Copper(II) sulfate exists as blue hydrated crystals and white anhydrous crystals. The  
 enthalpy changes of solution for these two substances may be represented by the  
 following simplified equations:



(a) (i)   Fill in the box and add labelled arrows to complete the Hess cycle to enable you to calculate





**(3)**

  (ii)    Calculate a value for the enthalpy change 

**(2)**

(b) Suggest why it is not possible to directly measure the enthalpy change for the conversion of the blue hydrated copper(II) sulfate crystals into the white anhydrous crystals.

**(1)**

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\*(c) (i)

Describe briefly the experimental procedure that you would use to obtain the data necessary to calculate ΔH1, given a known mass of hydrated copper(II) sulfate crystals, CuSO4.5H2O(s).

You should state the apparatus that you would use and any measurements that you would make.

You are **not** required to calculate the amounts of substances or to explain how you would use the data obtained.

**(4)**

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(ii)   The value for the enthalpy change from (c)(i) obtained by experiments in a school laboratory is likely to be significantly different from a data book value.

List **three** possible reasons for this which do **not** relate to the quality of the apparatus or chemicals used or possible mistakes in carrying out the procedure.

**(3)**

1

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2

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3

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**(Total for Question = 13 marks)**

ANSWERS FOLLOW:

**Q13.**



**Q8.**