EXPERIMENT NO. 11

2 In this experiment you will determine the enthalpy change of solution, ΔH_{sol}, for hydrated sodium thiosulfate, $Na_2S_2O_3 \cdot 5H_2O$. To do this you will measure the temperature change when a known mass of hydrated sodium thiosulfate is dissolved in a known volume of water.

FB 5 is hydrated sodium thiosulfate, $Na_2S_2O_3 \cdot 5H_2O$.

(a) Method

- Support the cup in the 250 cm^3 beaker.
- Use the 25 cm^3 measuring cylinder to transfer 20.0 cm^3 of distilled water into the cup.
- Weigh the stoppered container of **FB 5** and record the mass.
- Measure and record the initial temperature of the water in the cup.
- Add all the **FB 5** to the water in the cup.
- Stir the mixture and record the minimum temperature that is reached.
- Reweigh the stoppered container. Record the mass.
- Calculate and record the mass of **FB 5** added to the water and the change in temperature.

I	
II	
III	
IV	

[4]

(b) Calculations

(i) Calculate the energy change of the reaction.
(Assume that 4.2 J of heat energy changes the temperature of 1.0 cm^3 of solution by 1.0 °C.)
Show your working.

energy change = ... J [1]

(ii) Calculate the enthalpy change of solution, ΔH_{sol}, for hydrated sodium thiosulfate.

ΔH_{sol} for $Na_2S_2O_3 \cdot 5H_2O$ = ... kJ mol^{-1}
sign *value* [2]

(iii) Assume that under the same conditions, the enthalpy change of solution, ΔH_{sol}, for anhydrous sodium thiosulfate, $Na_2S_2O_3$, is $-7.7\,kJ\,mol^{-1}$.
Construct a Hess's cycle and determine the enthalpy change for the following reaction.
(If you were unable to calculate an answer to **(b)(ii)**, assume a value of $+32.2\,kJ\,mol^{-1}$. Note this is not the correct value.)

$$Na_2S_2O_3(s) + 5H_2O(l) \rightarrow Na_2S_2O_3 \bullet 5H_2O(s)$$

ΔH = ... kJ mol^{-1}
sign *value* [2]

(c) How would your temperature change in **(a)** be affected if your sample of **FB 5** contained a small amount of anhydrous sodium thiosulfate?
Explain your answer.

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..... [1]

[Total: 10]