

2 When hydrated sodium thiosulfate is dissolved in water the temperature of the liquid changes. You will carry out an experiment to determine the enthalpy change, ΔH , when one mole of hydrated sodium thiosulfate dissolves in water.

FA 3 is hydrated sodium thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

(a) Method

- Support the cup in the 250 cm^3 beaker.
- Use the 50 cm^3 measuring cylinder to transfer 30.0 cm^3 of distilled water into the cup.
- Measure the temperature of the water in the cup. Record this in the space for results.
- Weigh the container with **FA 3**. Record the mass.
- Tip all the **FA 3** into the cup.
- Stir the mixture until the minimum temperature is obtained. Record this temperature.
- Weigh the container with any residual **FA 3**. Record the mass.
- Calculate and record the mass of **FA 3** added.
- Calculate and record the temperature change.

Results

I	
II	
III	
IV	

[4]

(b) Calculations

(i) Calculate the amount, in mol, of hydrated sodium thiosulfate added.

amount of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ = mol [1]

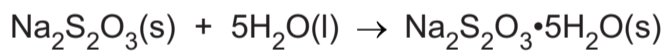
(ii) Calculate the energy change, in J, in your experiment.

energy change = J [1]

(iii) Calculate the enthalpy change, ΔH , in kJ mol^{-1} , when 1.00 mol of hydrated sodium thiosulfate dissolves in water. Show your working.

$\Delta H = \dots\dots \dots\dots \text{kJ mol}^{-1}$
sign *value* [1]

(c) The value calculated in (b)(iii) can be used to determine the enthalpy change, ΔH_r , for the following reaction.



Outline the method of one further experiment you would need to carry out to obtain the data necessary to calculate the value of ΔH_r .

Show how you would use your results from this experiment and (b)(iii) to calculate ΔH_r .

Do **not** carry out your experiment.

method

.....

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calculation

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[4]

[Total: 11]

Qualitative analysis

For each test you should record all your observations in the spaces provided.

Examples of observations include:

- colour changes seen
- the formation of any precipitate and its solubility (where appropriate) in an excess of the reagent added
- the formation of any gas and its identification (where appropriate) by a suitable test.

You should record clearly at what stage in a test an observation is made.

Where no change is observed, you should write 'no change'.

Where reagents are selected for use in a test, the name or correct formula of the element or compound must be given.

If any solution is warmed, a boiling tube must be used. If a solid is heated, a hard-glass test-tube must be used.

Rinse and reuse test-tubes and boiling tubes where possible.

No additional tests should be attempted.