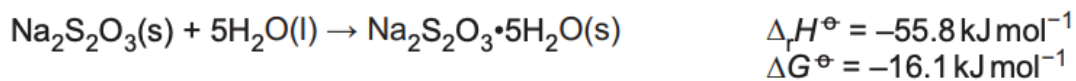




The standard enthalpy change of reaction,  $\Delta_r H^\ominus$ , and the standard free energy change,  $\Delta G^\ominus$ , for converting anhydrous sodium thiosulfate to hydrated sodium thiosulfate are shown below.



Standard entropies are given in the table.

Compound	$S^\ominus / \text{JK}^{-1} \text{ mol}^{-1}$
$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}(\text{s})$	372.4
$\text{H}_2\text{O}(\text{l})$	69.9

Determine the **standard** entropy,  $S^\ominus$ , of anhydrous sodium thiosulfate,  $\text{Na}_2\text{S}_2\text{O}_3(\text{s})$ .

Give your answer to **3** significant figures.

$S^\ominus = \dots\dots\dots \text{JK}^{-1} \text{ mol}^{-1}$  [4]



Calculate the enthalpy change of solution of magnesium hydroxide, using the following data.

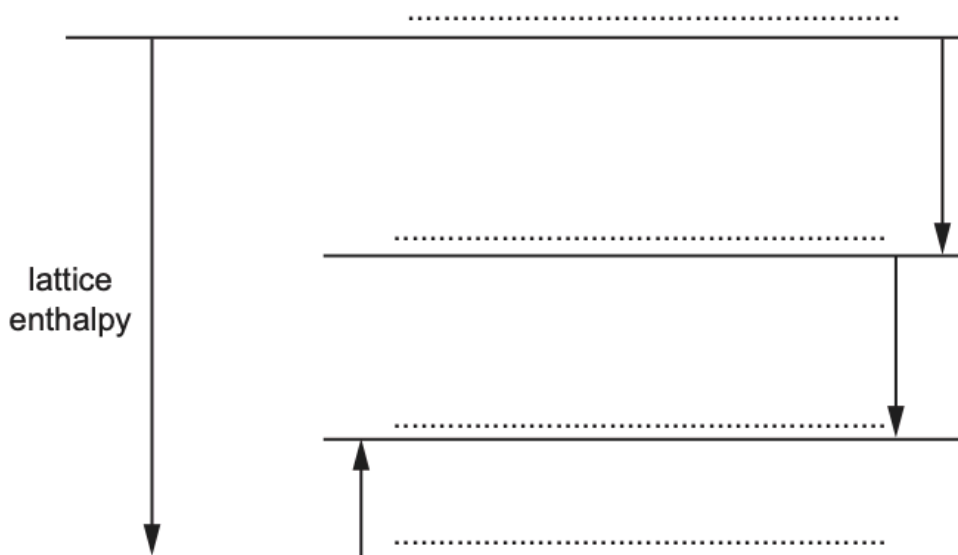
Energy or enthalpy change	Value / $\text{kJ mol}^{-1}$
Lattice energy of $\text{Mg(OH)}_2(\text{s})$	-2842
$\Delta_{\text{hyd}}H (\text{Mg}^{2+}(\text{aq}))$	-1920
$\Delta_{\text{hyd}}H (\text{OH}^{-}(\text{aq}))$	-460

(2)



The enthalpy change of hydration of  $F^-$  can be determined using the enthalpy changes in **Table 16.1** and the incomplete energy cycle below.

On the dotted lines, add the species present, including state symbols.



[4]

Calculate the enthalpy change of hydration of fluoride ions,  $F^-$ .

enthalpy change of hydration = .....  $\text{kJ mol}^{-1}$  [2]

Predict how the enthalpy changes of hydration of  $F^-$  and  $Cl^-$  would differ.

Explain your answer.

.....  
 .....  
 .....  
 ..... [2]