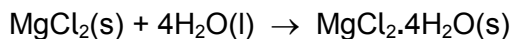


Section AAnswer **all** questions in the spaces provided**0 1**Anhydrous magnesium chloride, MgCl_2 , can absorb water to form the hydrated salt $\text{MgCl}_2 \cdot 4\text{H}_2\text{O}$ **0 1 . 1**Suggest **one** reason why the enthalpy change for this reaction cannot be determined directly by calorimetry.**[1 mark]**

0 1 . 2Some enthalpies of solution are shown in **Table 1**.**Table 1**

Salt	Enthalpy of solution / kJ mol^{-1}
$\text{MgCl}_2(\text{s})$	-155
$\text{MgCl}_2 \cdot 4\text{H}_2\text{O}(\text{s})$	-39

Calculate the enthalpy change for the absorption of water by $\text{MgCl}_2(\text{s})$ to form $\text{MgCl}_2 \cdot 4\text{H}_2\text{O}(\text{s})$.**[2 marks]**Enthalpy change _____ kJ mol^{-1} 

0 1 3

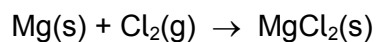
Describe how you would carry out an experiment to determine the enthalpy of solution of anhydrous magnesium chloride.
You should use about 0.8 g of anhydrous magnesium chloride.

Explain how your results could be used to calculate the enthalpy of solution.

[6 marks]



0 1 4 Anhydrous magnesium chloride can be formed by direct reaction between its elements.



The free-energy change, ΔG , for this reaction varies with temperature as shown in **Table 2**.

Table 2

T / K	$\Delta G / \text{kJ mol}^{-1}$
298	-592.5
288	-594.2
273	-596.7
260	-598.8
240	-602.2

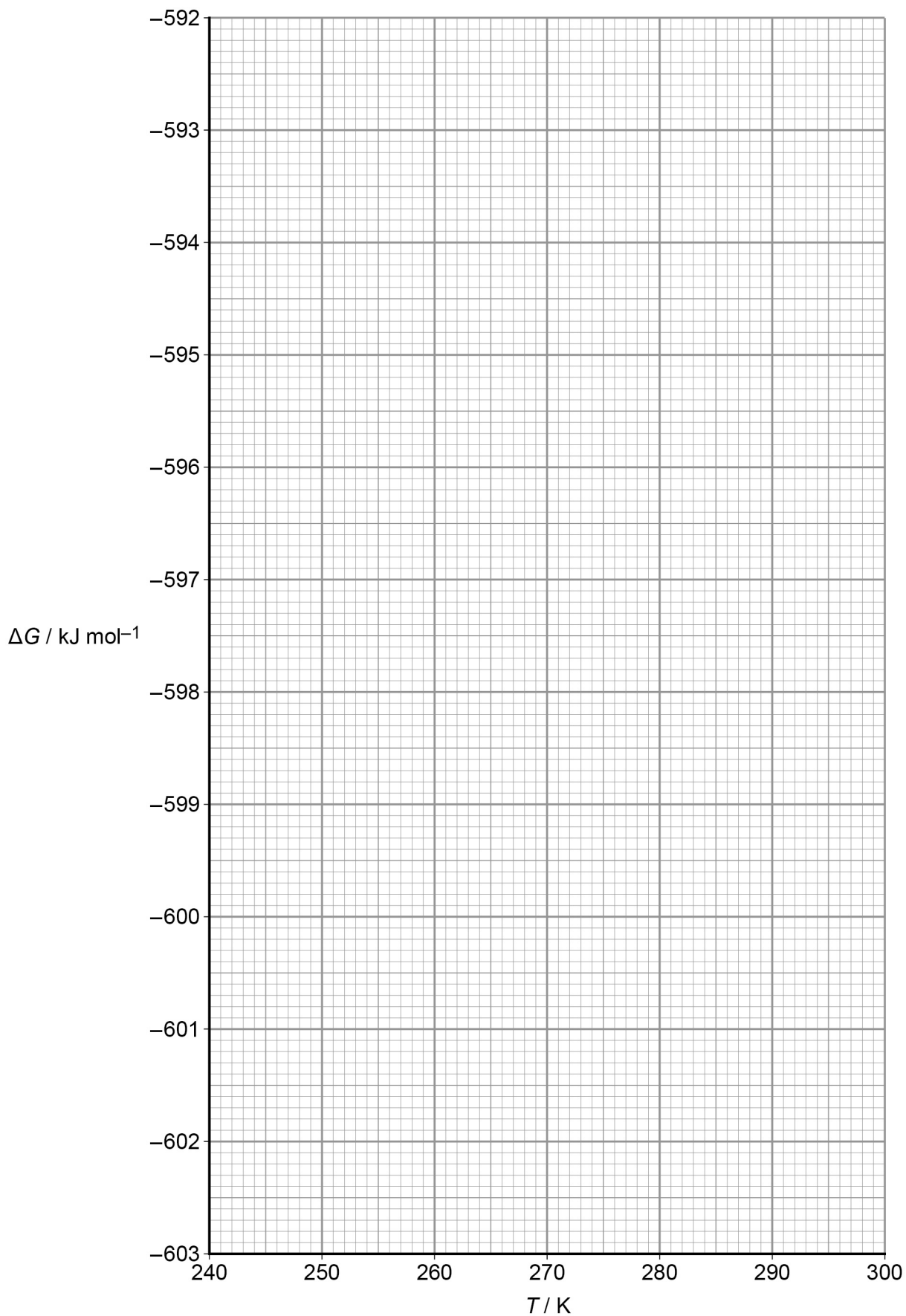
Use these data to plot a graph of free-energy change against temperature on the grid opposite.

Calculate the gradient of the line on your graph and hence calculate the entropy change, ΔS , in $\text{J K}^{-1} \text{mol}^{-1}$, for the formation of anhydrous magnesium chloride from its elements.

Show your working.

[5 marks]





ΔS _____ $\text{JK}^{-1} \text{mol}^{-1}$

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