A level Chemistry B

H433/03 Practical skills in chemistry

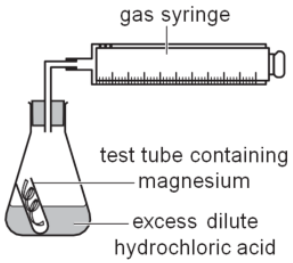
Question Set 2

1 (a) (i) Two students decide to study the reaction of magnesium with dilute hydrochloric acid to find the order of this reaction with respect to the acid.

The equation for the reaction is:

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

The students use the following apparatus:



The students run **five** experiments each using a different concentration of hydrochloric acid.

They use the same length of magnesium ribbon each time.

Why was the length of the magnesium ribbon kept the same? **[1]**

1 (a) (ii) $50\,cm^3$ acid is used each time.
The concentration ranged from 0.1 to 0.5 $mol\,dm^{-3}$.

Calculate the **maximum** mass of magnesium ribbon that would completely react with the acid in **all** five experiments.

mass = ……g **[3]**

1 (a) (iii) Calculate the maximum length of magnesium ribbon needed to completely react with theacid in all the experiments.

The mass per unit length of Mg ribbon = $1.3 \times 10^{-2}\,g\,cm^{-1}$

length =…….. cm **[1]**

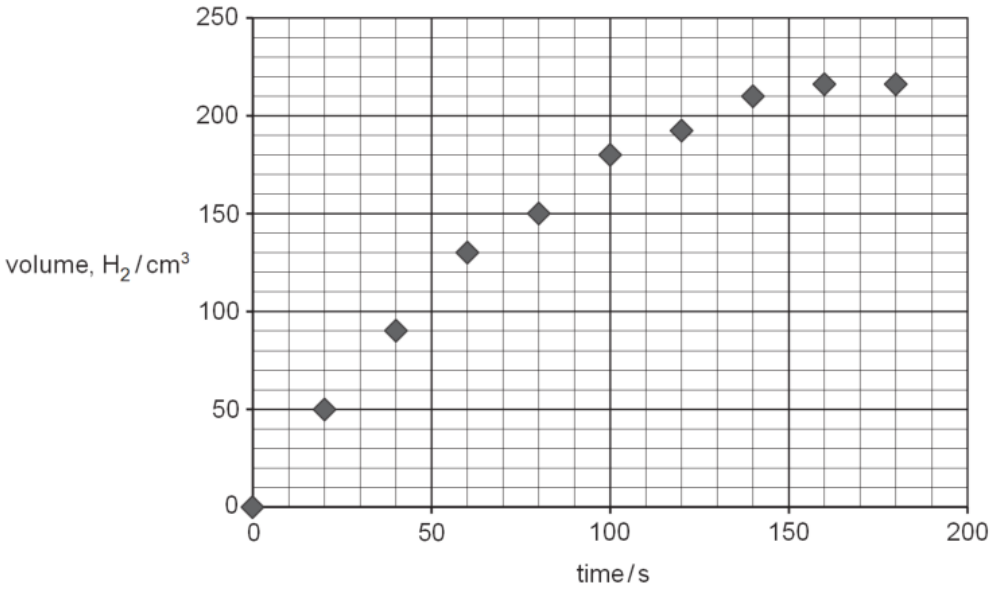
1 (b) The students predict that the reaction will be second order with respect to acid.

Write the rate equation that would be appropriate for this prediction **[1]**

1 (c) The students plot a graph of volume of hydrogen against time.
The graph of the results when the concentration of hydrochloric acid is 0.5 mol dm^3 is shownbelow.

Draw a line of best fit on the graph.
Use your line of best fit to calculate the initial rate of reaction at this concentration and givethe units.

Show your working on the graph.



initial rate ..... units .....

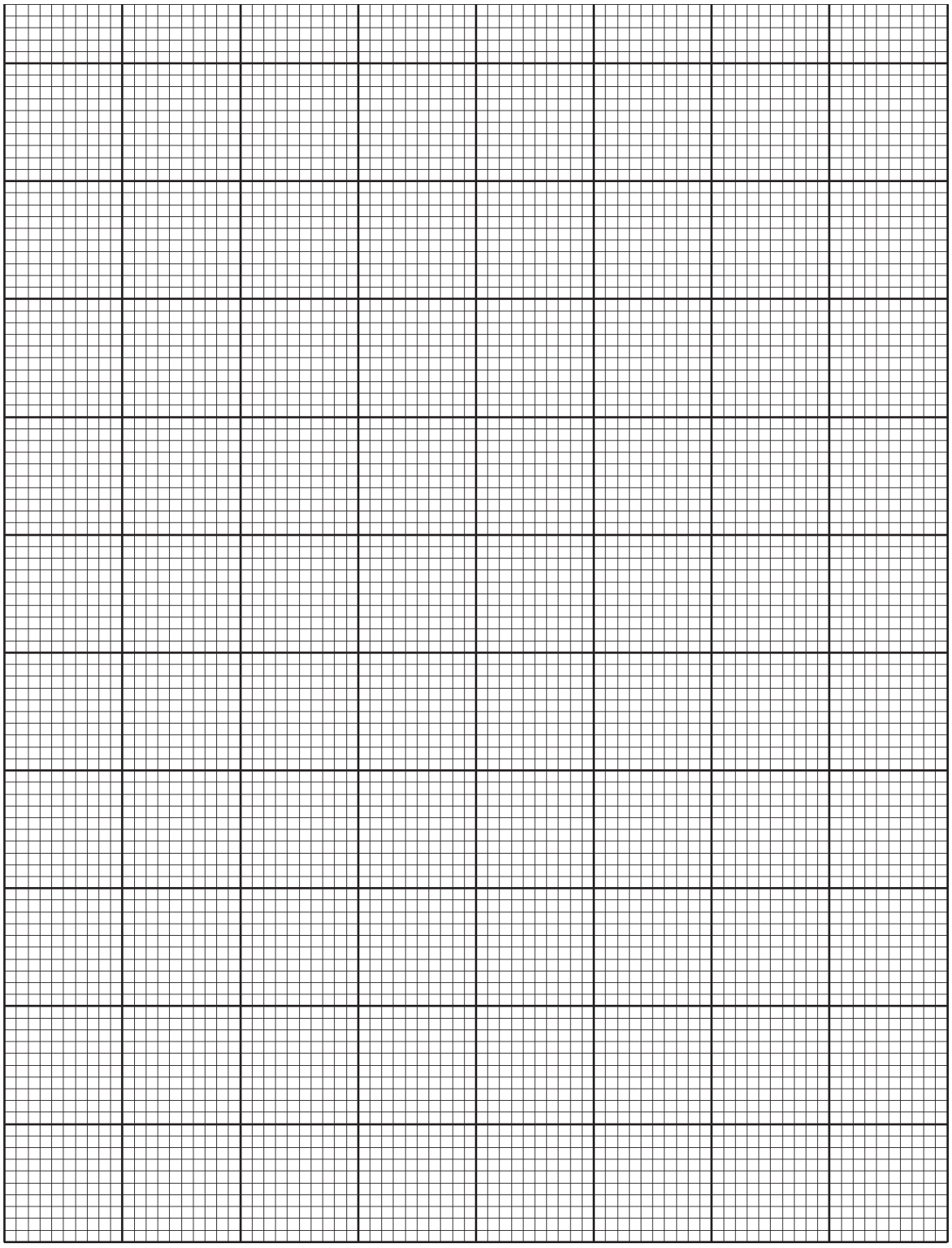
[5]

1 (d) The students decide to measure the activation enthalpy for the reaction.
They repeat the experiment at different temperatures using a fixed concentration of acid.

The following table shows the data from their experiments.

$\ln k$	Temperature /°C	Temperature, T/K	$1/T$ / K^{-1} ($\times 10^{-3}$)
–5.46	15.6	288.6	3.47
–4.92	30.3	303.3	3.30
–4.34	45.0	318.0	3.14
–3.73	65.0	338.0	2.96

Use the data to plot a suitable graph on the next page and work out the activation enthalpy for thereaction.



activation enthalpy =…… kJ mol^{-1} **[6]**

Total Marks for Question Set 2 = 17

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