

You are required to determine the:

- i) temperature change when magnesium reacts with excess hydrochloric acid
- ii) number of moles of hydrochloric acid that remain unreacted
- iii) number of moles of magnesium that reacted
- iv) molar heat of reaction between magnesium and hydrochloric acid.

### Procedure I

Using a burette, measure  $50\text{ cm}^3$  of solution **B** and place it in a 100 ml beaker. Measure the temperature of solution **B** in the 100 ml beaker and record the value in table 1. Put the magnesium ribbon in the  $50\text{ cm}^3$  of solution **B** in the 100 ml beaker and **immediately** start a stop watch/clock. Stir the mixture continuously with the thermometer making sure that the magnesium ribbon remains inside the solution as it reacts. Measure the temperature after every 30 seconds and record the values in table 1. Continue stirring and measuring the temperature to complete table 1.

Keep the resulting solution for use in procedure 2.

**Table 1**

(a)

Time (sec)	0	30	60	90	120	150	180	210	240	270	300
Temperature ( $^{\circ}\text{C}$ )											

(5 marks)

- (i) Plot a graph of temperature (Y-axis) against time on the grid provided.  
(3 marks)
- (ii) On the graph, show the maximum change in temperature,  $\Delta T$ , and determine its value.  
(1 mark)

Value of  $\Delta T$ . .....

### Procedure 2

Transfer **all** the solution obtained in procedure 1 into a 250 ml conical flask. Clean the burette and use it to place  $50\text{ cm}^3$  of distilled water into the beaker used in procedure 1. Transfer all the  $50\text{ cm}^3$  of water into the 250 ml conical flask containing the solution from procedure 1. Label this as solution **D**. Empty the burette and fill it with solution **C**.