

Pipette 25 cm^3 of solution **D** and place it into an empty 250 ml conical flask. Add two drops of phenolphthalein indicator and titrate solution **C** against solution **D**. Record the results in table 2. Repeat the titration of solution **C** against solution **D** and complete table 2.

(b)

Table 2

| | I | II | III |
|--|---|----|-----|
| Final burette reading | | | |
| Initial burette reading | | | |
| Volume of solution C used (cm^3) | | | |

(4 marks)

(i) Calculate the average volume of solution **C** used. (1 mark)

(ii) Calculate the number of moles of:

I 0.3M sodium hydroxide used (1 mark)

II hydrochloric acid in 25 cm^3 of solution **D** (1 mark)

III hydrochloric acid in 100 cm^3 of solution **D** (1 mark)

IV hydrochloric acid in 50 cm^3 of solution **B** (1 mark)

V hydrochloric acid that reacted with magnesium (1 mark)

VI magnesium that reacted. (2 marks)

(c) Using your answer in VI above, determine the molar heat of reaction between magnesium and hydrochloric acid. (Assume the heat capacity of the solution is $4.2\text{ Jg}^{-1}\text{deg}^{-1}$ and density is 1.0 g/cm^3). (4 marks)

This question tested on the candidates' ability to:

- use a burette and pipette to measure volumes of solutions accurately.
- use a stop clock or watch to measure time accurately
- use a thermometer to measure temperatures accurately
- follow a written procedure to obtain accurate data
- plot a graph using the data obtained
- use the graph to draw some conclusions
- use some numerical figures obtained from the graph to solve some simple calculations on mole concept