Section B [16 marks]

Answer any **two** questions from this section in the spaces provided.

5 Lithium, sodium and potassium are elements in Group I of the Periodic Table.
Rubidium, Rb, is another element in Group I.

(a) How many electron(s) is/are in the outer shell of a rubidium atom?

…….. [1]

(b) Complete Table 5.1 about an atom of rubidium.

Table 5.1

mass number	85
number of protons	
number of electrons	
number of neutrons	

[1]

(c) Predict **two** physical properties of rubidium.

……..

…….. [2]

(d) A scientist predicts that rubidium reacts violently with water.

(i) Write a balanced chemical equation for this reaction.

…… [1]

(ii) Draw a 'dot and cross' diagram to show the bonding in a molecule of water. Show the outer electrons only.

[2]

(e) What is the colour of the resulting solution if Universal Indicator is added to the reaction in **(d)**?

…… [1]

6 A student carries out an experiment to study the reaction between dilute hydrochloric acid and magnesium carbonate.

The word equation for the reaction can be represented as

magnesium carbonate + hydrochloric acid $\rightarrow$ magnesium chloride + carbon dioxide + water

(a) **(i)** Write a balanced chemical equation for the reaction.

…… [1]

(ii) Describe a test to identify carbon dioxide gas.

test ……

……

observation ……..

…… [2]

(b) The carbon dioxide produced in the experiment is collected in a gas syringe.
Its volume is measured at one minute intervals.
The results obtained from this experiment are plotted. The graph is shown in Fig. 6.1.

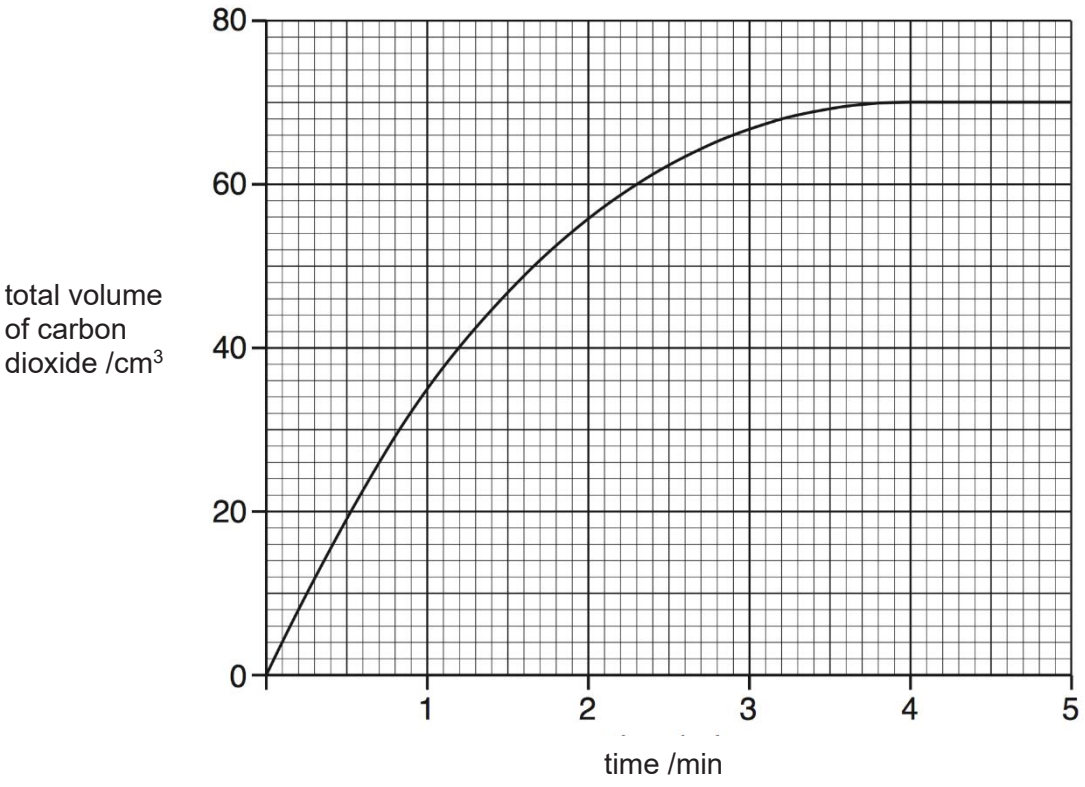


Fig. 6.1

(i) What is the volume of carbon dioxide gas collected after 2 minutes?

volume = ……..…… cm^3 [1]

(ii) After how many minutes does the reaction stop?

time = …….. minutes [1]

(c) Describe how crystals of magnesium chloride can be obtained from the resulting solution.

……..

……..

…….. [2]

(d) Suggest an alternative chemical that can be used to react with dilute hydrochloric acid to obtain magnesium chloride.

…….. [1]

7 Methane is the first member of the homologous series called alkanes.
It is highly flammable and is a useful source of energy when it is completely burnt in air.

(a) Write a balanced chemical equation, including state symbols, for the complete combustion of methane in air.

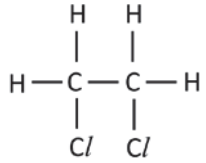
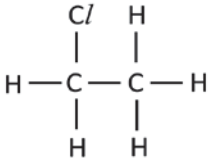
……. [2]

(b) 1 mole of methane produces 160 kJ of energy when completely burnt in air.
Calculate the amount of energy produced when 320 g of methane is burnt.

[2]

(c) Table 7.1 shows the products formed when hydrocarbons **X** and **Y** are reacted with chlorine.

Table 7.1

hydrocarbon	product formed when reacted with chlorine
X	 dichloroethane
Y	 chloroethane

(i) Write the general formula of the homologous series that hydrocarbon **Y** belongs to.

…… [1]

(ii) State the type of reaction and the condition needed for hydrocarbon **Y** to react with chlorine to form chloroethane.

type of reaction ……. [1]

condition …..……... [1]

(iii) Hydrogen gas can be added to hydrocarbon **X** to obtain hydrocarbon **Y**. The reaction occurs at a temperature of 200°C in the presence of a catalyst. Name the catalyst.

…….. [1]

End of Paper