

**Paper Reference(s)    1SC0/2CF**

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Combined Science**  
**Paper 5: Chemistry 2**  
**Foundation Tier**

**Wednesday 12 June 2019 – Morning**

**Time: 1 hour 10 minutes plus your additional  
time allowance**

**INSTRUCTIONS TO CANDIDATES**  
**Write your centre number, candidate number,  
surname, other names and your signature in  
the boxes below. Check that you have the  
correct question paper.**

<b>Centre No.</b>					
<b>Candidate No.</b>					
<b>Surname</b>					
<b>Other names</b>					
<b>Signature</b>					
<b>Paper Reference</b>	1	S	C	0	/ 2 C F

- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must show all your working out with your answer clearly identified at the end of your solution.**

**MATERIALS REQUIRED FOR EXAMINATION**  
**Calculator, ruler**

**ITEMS INCLUDED WITH QUESTION PAPERS**  
**Periodic Table**

**INFORMATION FOR CANDIDATES**

- **The total mark for this paper is 60.**
- **The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**(Continued on next page)**

**(Turn over)**

- In questions marked with an **ASTERISK (\*)**, marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- A periodic table is provided.

### **ADVICE TO CANDIDATES**

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

**(Turn over)**

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.**

- 1 (a) Plants release oxygen into the atmosphere.**

**What is the name of the process that releases oxygen into the atmosphere?  
(1 mark)**

- ☐ **A combustion**
- ☐ **B oxidation**
- ☐ **C photosynthesis**
- ☐ **D polymerisation**

**(Question continues on next page)**

**(Turn over)**

**(b) The atmosphere contains 21% of oxygen.**

**(i) Figure 1 on page 6 shows an incomplete bar chart of the main gases in the atmosphere.**

**Complete the bar chart by showing the percentage of oxygen in the atmosphere.  
(1 mark)**

**(Question continues on next page)**

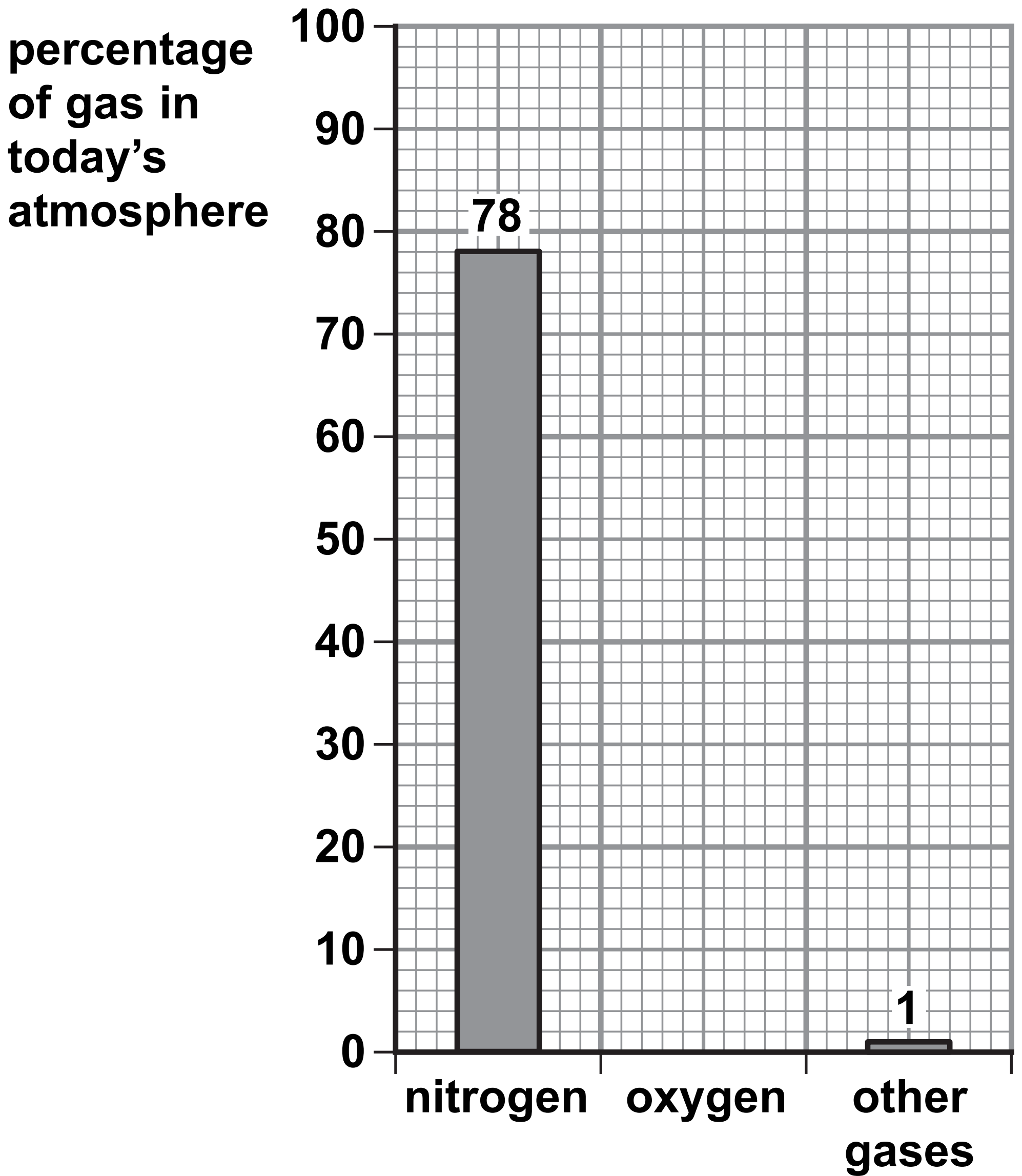


Figure 1

(Question continues on next page)

(Turn over)

**(ii) Calculate the volume of oxygen present in  $300\text{ cm}^3$  of air.**

**(volumes are measured under the same conditions of temperature and pressure) (2 marks)**

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**volume of oxygen = \_\_\_\_\_  $\text{cm}^3$**

**(Question continues on next page)**

**(Turn over)**

**(c) An atom of an element has an atomic number and a mass number.**

**Draw one straight line from each of these to the numbers of subatomic particles it shows to be present in an atom. (2 marks)**

**number of subatomic particles in an atom**

**atomic number**

**mass number**

• **number of protons**

• **number of neutrons**

• **total number of protons and electrons**

• **total number of protons and neutrons**

• **total number of protons, neutrons and electrons**

**(Question continues on next page)**

**(Turn over)**



**(d) Which test shows a gas is oxygen?  
(1 mark)**

- ☐ **A a few drops of limewater will turn cloudy when shaken with the gas**
- ☐ **B a glowing splint will relight when placed in the gas**
- ☐ **C a lighted splint placed in the gas will cause a pop**
- ☐ **D a piece of damp red litmus paper will turn blue when placed in the gas**

**(TOTAL FOR QUESTION 1 = 7 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

**2 (a) Complete the following sentences.**

**(i) The name given to group 7 in the  
periodic table is \_\_\_\_\_ .  
(1 mark)**

**(ii) The name given to group 0 in the  
periodic table is \_\_\_\_\_ .  
(1 mark)**

**(Question continues on next page)**

**(Turn over)**

**(b) Which of the following rows gives the colours of the group 7 elements chlorine and bromine at room temperature? (1 mark)**

	<b>chlorine</b>	<b>bromine</b>
<input type="checkbox"/> <b>A</b>	<b>red-brown</b>	<b>purple</b>
<input type="checkbox"/> <b>B</b>	<b>yellow-green</b>	<b>grey</b>
<input type="checkbox"/> <b>C</b>	<b>yellow-green</b>	<b>red-brown</b>
<input type="checkbox"/> <b>D</b>	<b>grey</b>	<b>red-brown</b>

**(Question continues on next page)**

**(Turn over)**

**(c) Figure 2 shows the melting and boiling points of bromine and iodine.**

<b>element</b>	<b>melting point in °C</b>	<b>boiling point in °C</b>
<b>bromine</b>	<b>−7</b>	<b>59</b>
<b>iodine</b>	<b>114</b>	<b>184</b>

**Figure 2**

**Using the information in Figure 2, which row shows the physical states of these elements at 50 °C? (1 mark)**

	<b>bromine</b>	<b>iodine</b>
<input type="checkbox"/> <b>A</b>	<b>liquid</b>	<b>gas</b>
<input type="checkbox"/> <b>B</b>	<b>solid</b>	<b>liquid</b>
<input type="checkbox"/> <b>C</b>	<b>gas</b>	<b>solid</b>
<input type="checkbox"/> <b>D</b>	<b>liquid</b>	<b>solid</b>

**(Question continues on next page)**

**(Turn over)**

**(d) The densities of some elements in group 0 are shown in Figure 3.**

<b>name</b>	<b>density in g cm<sup>-3</sup></b>
<b>helium</b>	<b>0.15</b>
<b>neon</b>	<b>1.2</b>
<b>argon</b>	<b>1.4</b>
<b>krypton</b>	
<b>xenon</b>	<b>3.5</b>

**Figure 3**

**Use the information in Figure 3 to suggest the density of krypton.  
(1 mark)**

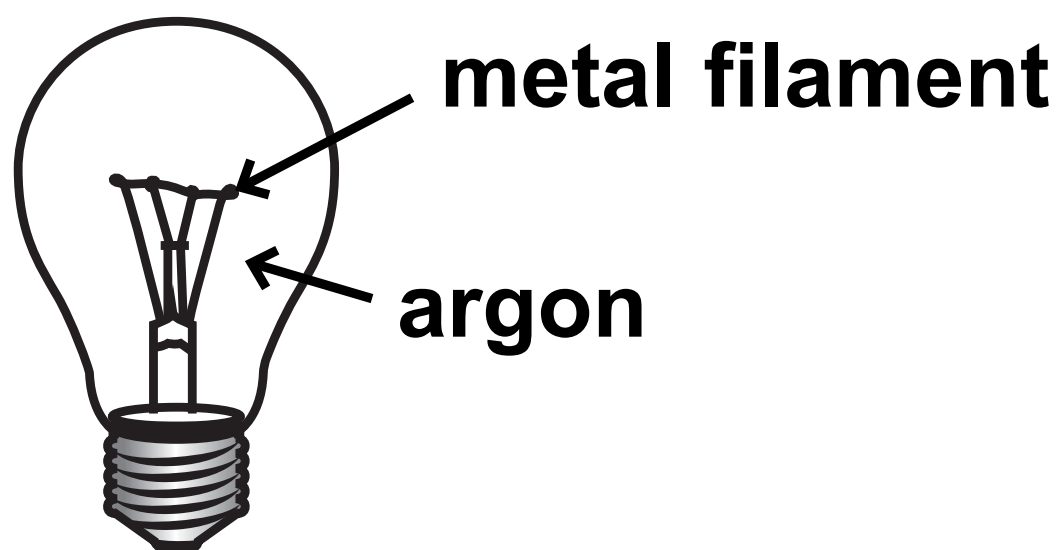
**density of krypton = \_\_\_\_\_ g cm<sup>-3</sup>**

**(Question continues on next page)**

**(Turn over)**

**(e) For many years, argon was used to fill filament light bulbs.**

**A filament light bulb is shown in Figure 4.**



**Figure 4**

**When the bulb is in use the metal filament becomes extremely hot.**

**Explain why argon, rather than air, was used to fill filament light bulbs.  
(2 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

**15**

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**(TOTAL FOR QUESTION 2 = 7 MARKS)**

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**(Turn over)**

- 3 A student poured  $50\text{ cm}^3$  water into a beaker and measured the water's temperature.

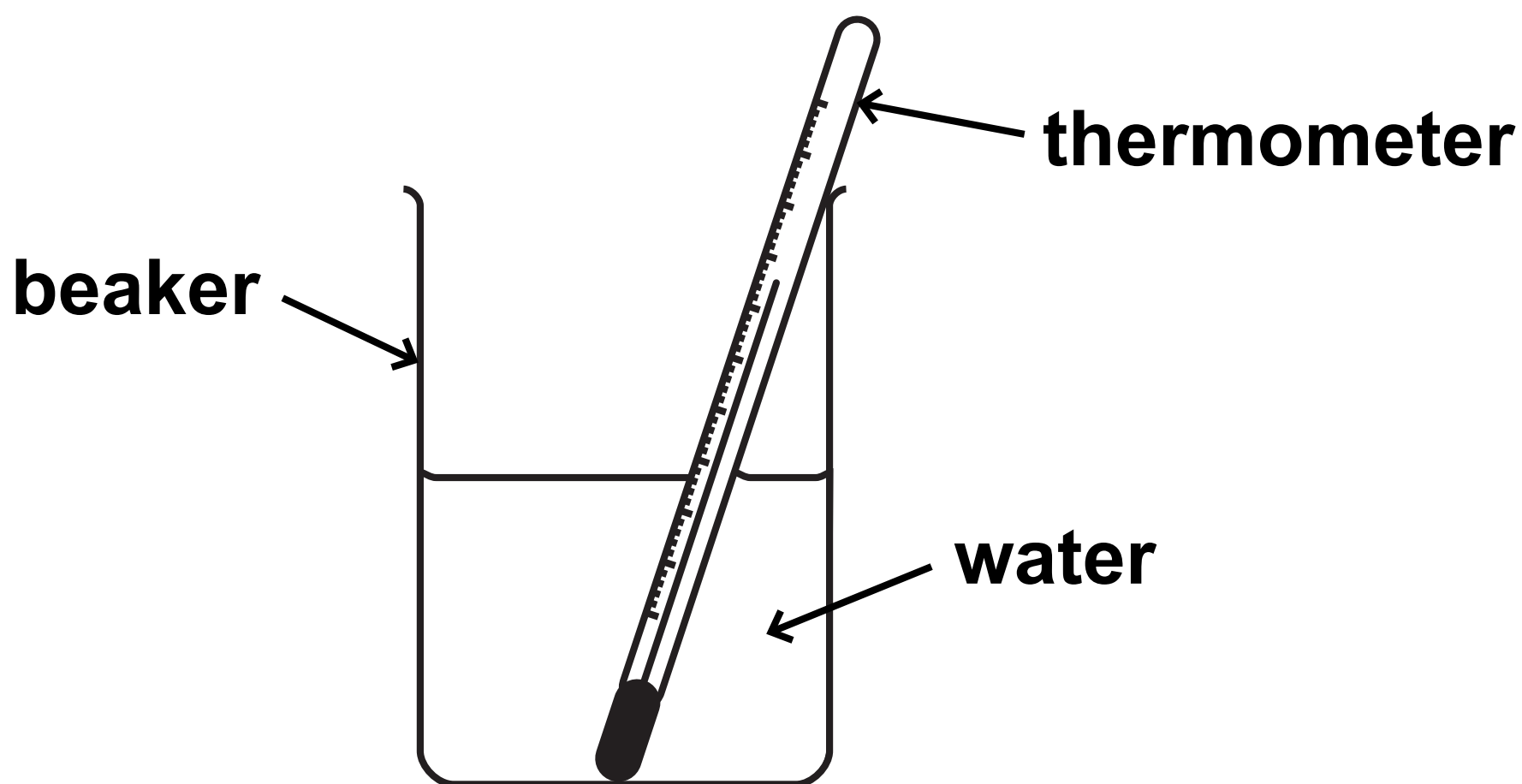


Figure 5

The student added  $1.00\text{ g}$  calcium chloride to the water, stirred the mixture and then recorded the temperature.

- (a) Give the name of the apparatus that could be used to measure  $1.00\text{ g}$  of calcium chloride. (1 mark)

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(Question continues on next page)

(Turn over)



**(b) The student's results were**

**temperature of water at start = 21 °C**

**temperature of mixture after stirring = 32 °C**

**Explain, using these results, the type of heat energy change that occurs when calcium chloride dissolves in water. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

**(c) Calcium chloride is hazardous to health.**

**(i) Which hazard symbol on page 19 would be expected to be seen on a container of calcium chloride?  
(1 mark)**

**(Question continues on next page)**

**(Turn over)**

☐

A


☐

B


☐

C


☐

D



(Question continues on next page)

(Turn over)

**(ii) Give a safety precaution that the student should take during the experiment. (1 mark)**

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**(d) State ONE way in which the apparatus could be changed to reduce the amount of heat energy lost during the experiment. (1 mark)**

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**(e) The concentration of a calcium chloride solution is  $12 \text{ g dm}^{-3}$ .**

**(Question continues on next page)**

**(Turn over)**

21

**Calculate the volume of this solution,  
in  $\text{cm}^3$ , that contains 9.0 g of  
calcium chloride.**

**You must show your working.  
(3 marks)**

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**volume of solution = \_\_\_\_\_  $\text{cm}^3$**

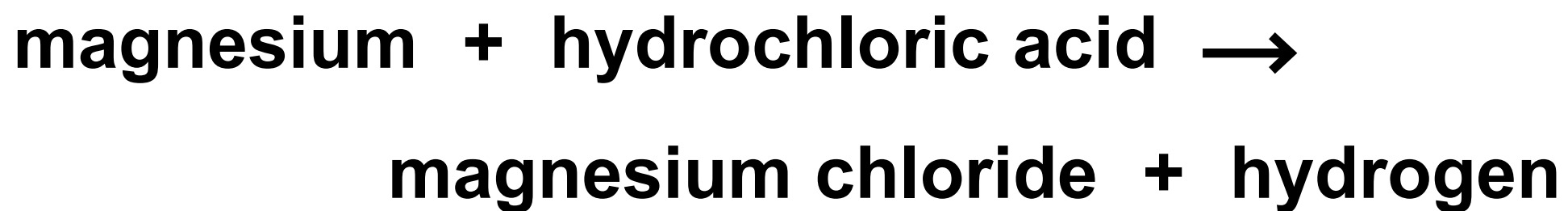
**(TOTAL FOR QUESTION 3 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 4 The word equation for the reaction between magnesium and dilute hydrochloric acid is



The reaction was carried out using the apparatus shown in Figure 6.

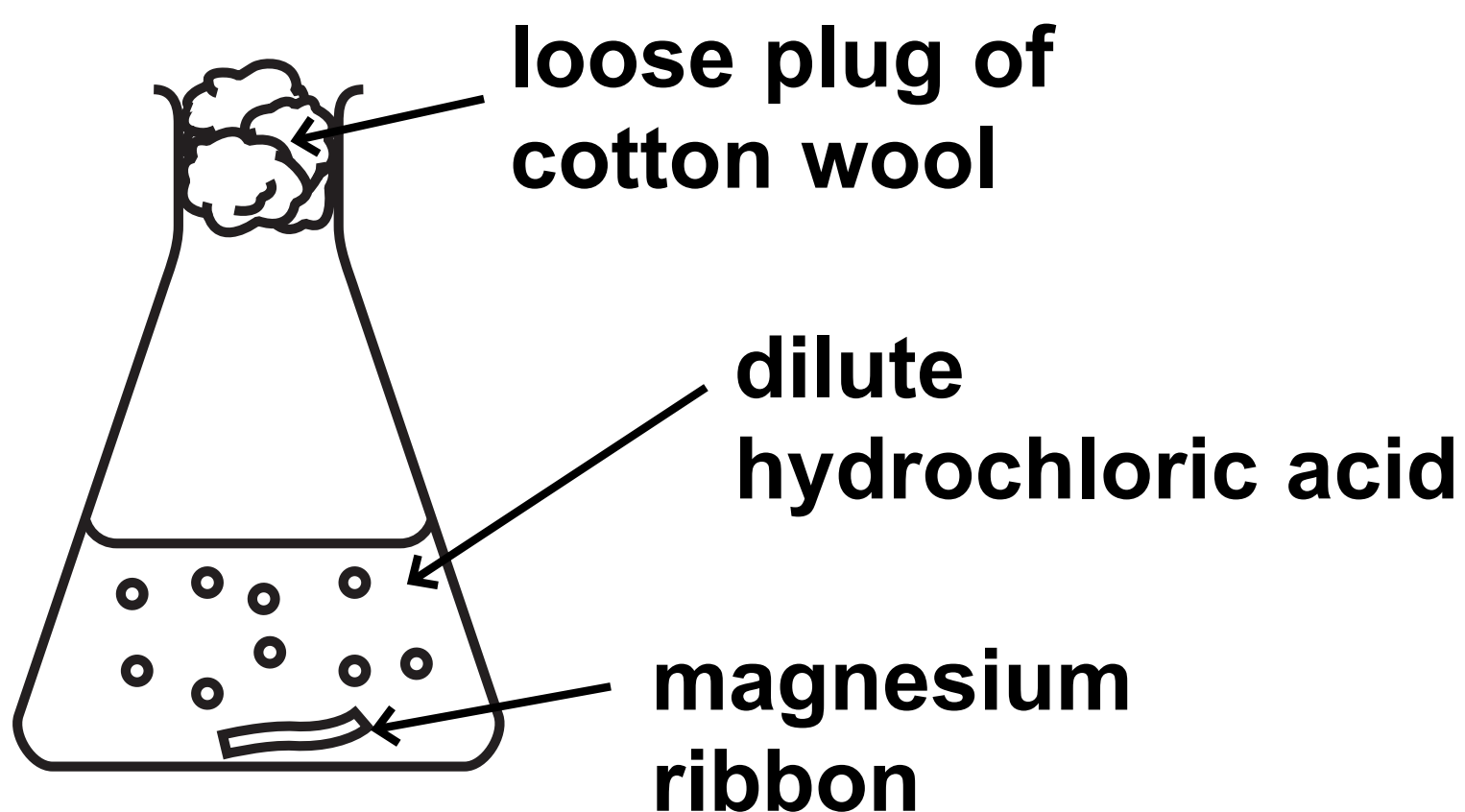


Figure 6

(Question continues on next page)

(Turn over)

**A strip of magnesium ribbon was placed in the conical flask.**

**100 cm<sup>3</sup> of dilute hydrochloric acid was added to the conical flask.**

**The mass of the flask and contents was measured at regular intervals.**

**The loss in mass was calculated.**

**Figure 7 on page 24 shows a graph of the results.**

**(Question continues on next page)**

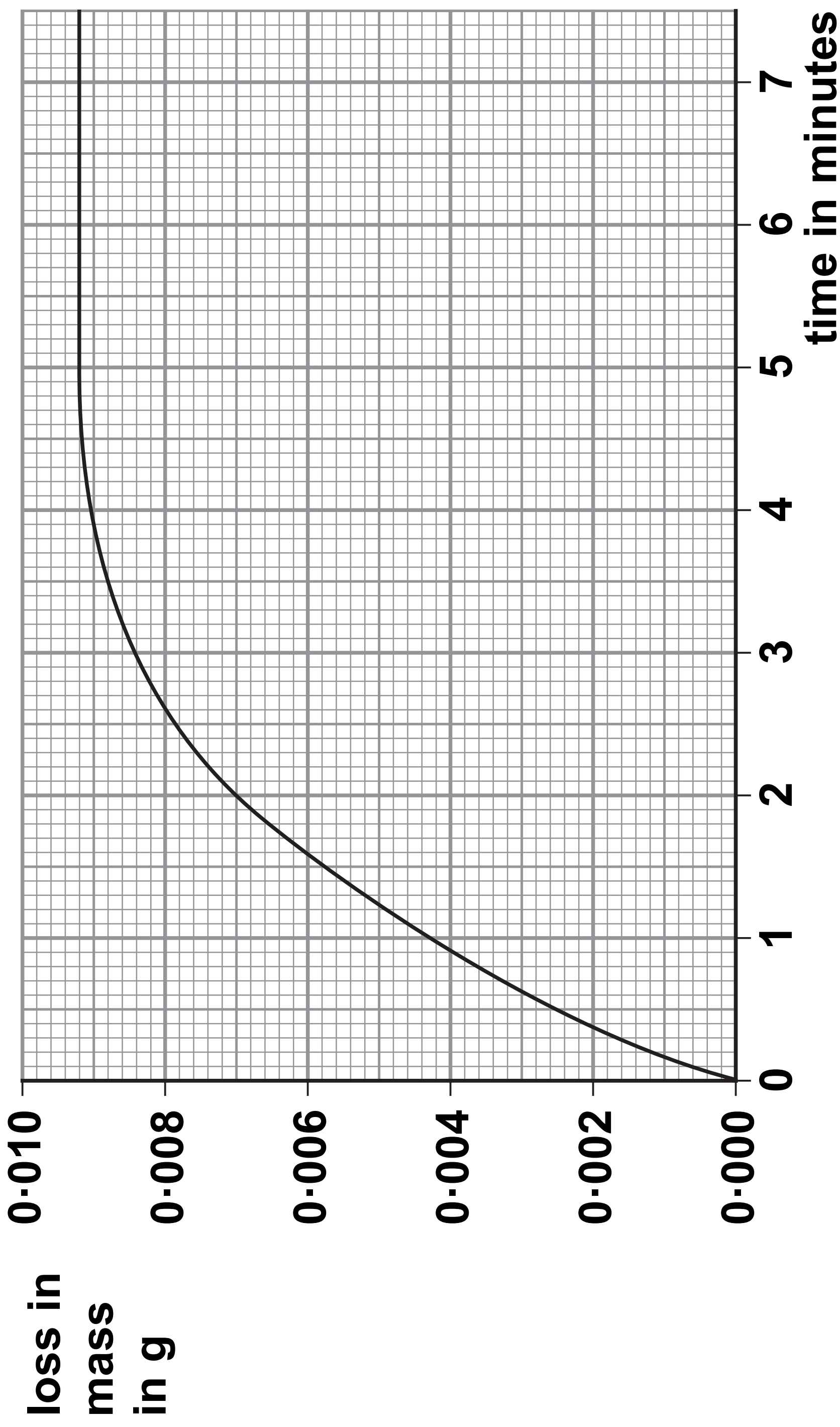


Figure 7

(Question continues on next page)

(Turn over)



**(a) Name the apparatus that could be used to measure out  $100\text{ cm}^3$  of dilute hydrochloric acid. (1 mark)**

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**(b) Explain why there is a loss in mass of the flask and contents. (2 marks)**

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**(c) The graph shows that the rate of reaction slows as the reaction takes place.**

**(Question continues on next page)**

**(Turn over)**

**Explain, in terms of particles,  
why the rate of reaction between  
magnesium ribbon and dilute  
hydrochloric acid slows as the  
reaction takes place. (3 marks)**

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**(Question continues on next page)**

**(Turn over)**

- (d) The experiment was repeated using the acid at a higher temperature. All other conditions were kept the same.**

**State the effect of the higher temperature on the mass loss after two minutes. (1 mark)**

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**(Question continues on next page)**

- (e) The original experiment was repeated using the same mass of magnesium powder instead of the magnesium ribbon. All other conditions were kept the same.**

**Sketch, on the graph in Figure 7 on page 24, the line you would expect for this experiment. (2 marks)**

**(Question continues on next page)**

**(f) Some reactions are affected by the presence of a catalyst.**

**(i) State the effect of a catalyst on a reaction. (1 mark)**

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**(ii) Devise a simple experiment to find out what happens to the mass of a solid catalyst during a reaction. (3 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

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**(TOTAL FOR QUESTION 4 = 13 MARKS)**

**(Questions continue on next page)**

**5 Most of the fuels used today are obtained from crude oil.**

**(a) Which statement about crude oil is correct? (1 mark)**

- ☐ **A crude oil is a compound of different hydrocarbons**
- ☐ **B crude oil is a mixture of hydrocarbons**
- ☐ **C crude oil contains different hydrocarbons, all with the same molecular formula**
- ☐ **D crude oil is an unlimited supply of hydrocarbons**

**(Question continues on next page)**

**(Turn over)**

**(b) Crude oil is separated into several fractions by fractional distillation. Two of these fractions are kerosene and diesel oil.**

**(i) State a use for each of these fractions. (2 marks)**

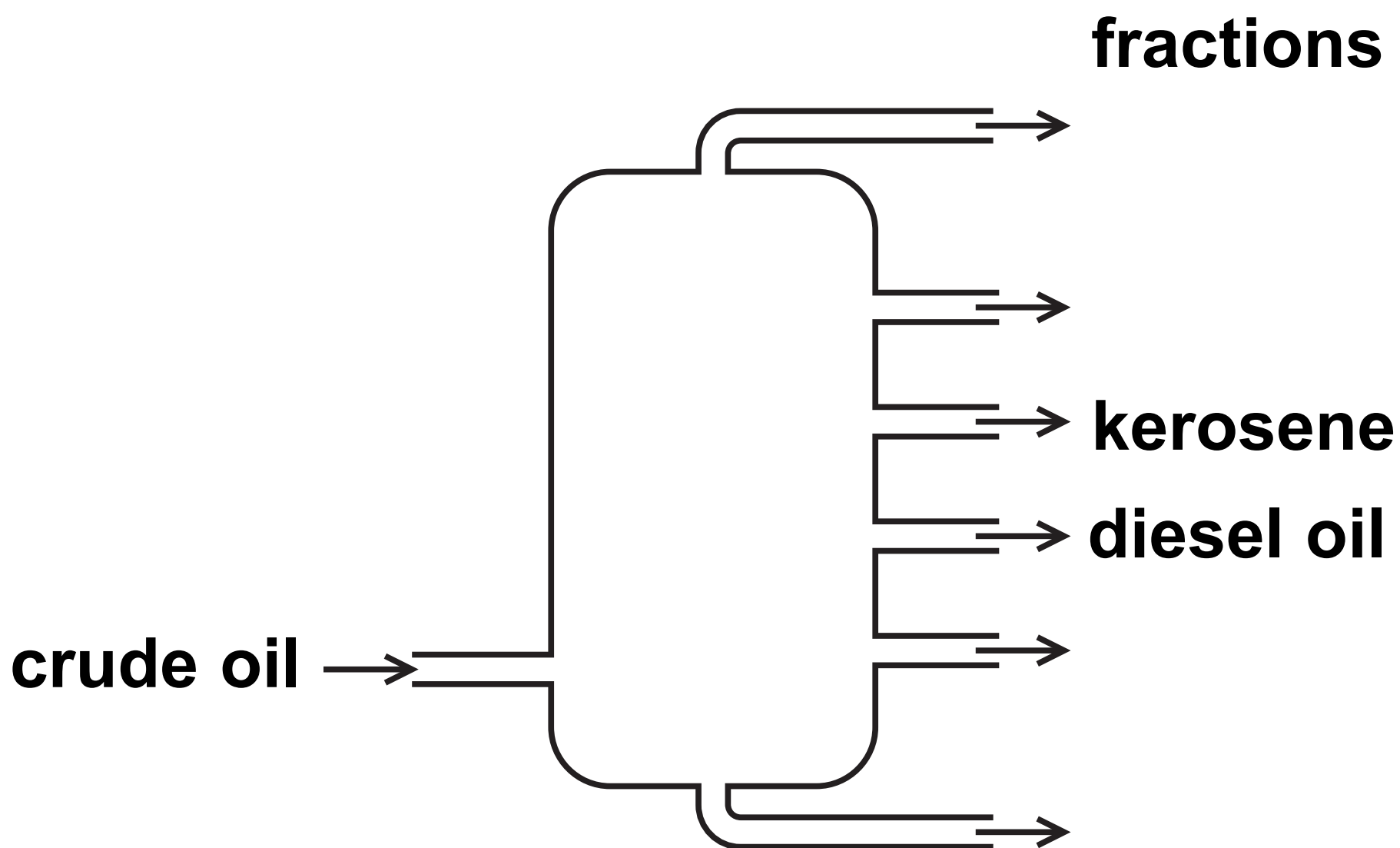
**kerosene** \_\_\_\_\_

**diesel oil** \_\_\_\_\_

**(Question continues on next page)**



- (ii) Figure 8 shows where the fractions kerosene and diesel oil are produced in the fractionating column.



**Figure 8**

**Kerosene is obtained higher up the column than diesel oil.  
Kerosene and diesel oil fractions have slightly different properties.**

**(Question continues on next page)**

**(Turn over)**

**Choose a property.  
State how this property for  
kerosene compares with the  
property for diesel oil. (1 mark)**

**property** \_\_\_\_\_

**comparison** \_\_\_\_\_

**(Question continues on next page)**

(c) Figure 9 shows the formulae of a molecule of butane and of a molecule of pentane. Butane and pentane are neighbouring members of the same homologous series.

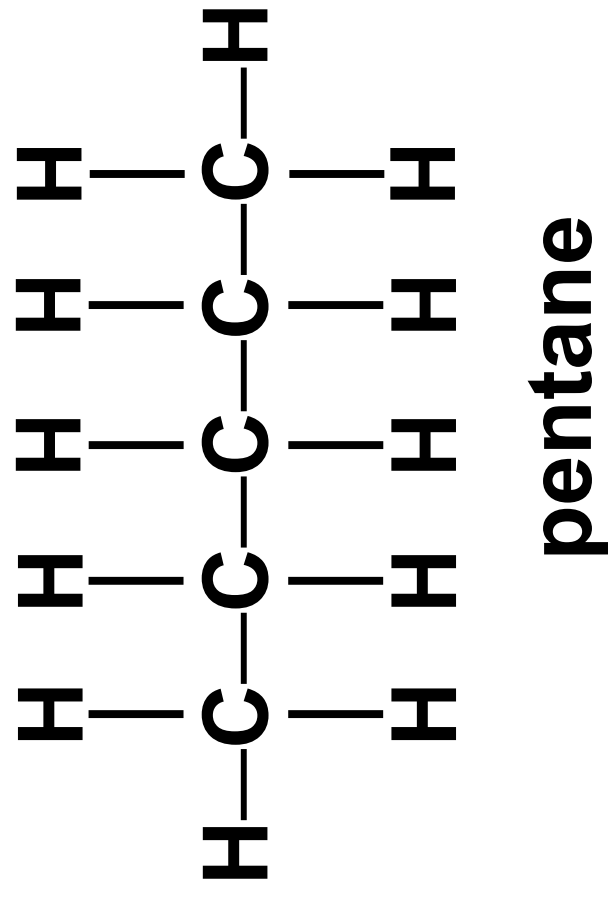
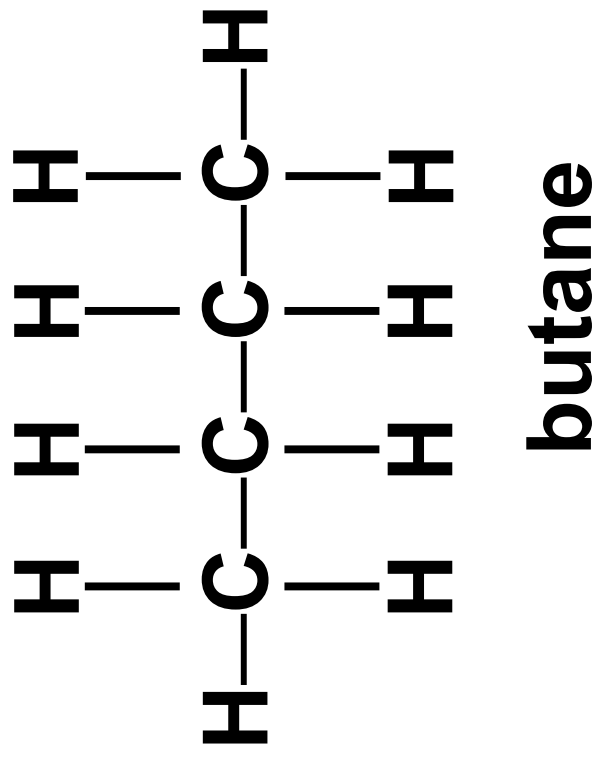


Figure 9

(Question continues on next page)

- (i) Explain, using these formulae, why butane and pentane are neighbouring members of the same homologous series.  
(2 marks)

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(Question continues on next page)

(Turn over)

**(ii) Butane has the formula  $\text{C}_4\text{H}_{10}$ .**

**Calculate the mass of carbon in  
100 g of butane.**

**Give your answer to three  
significant figures.**

**(relative atomic masses:  $\text{H} = 1.00$ ,  $\text{C} = 12.0$ ;  
relative formula mass:  $\text{C}_4\text{H}_{10} = 58.0$ )**

**You must show your working.  
(3 marks)**

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**mass of carbon = \_\_\_\_\_ g**

**(Question continues on next page)**

**(Turn over)**

**(iii) Butane burns completely in air to form carbon dioxide and water.**

**Write the word equation for this reaction. (2 marks)**

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**(TOTAL FOR QUESTION 5 = 11 MARKS)**

**(Questions continue on next page)**

**(Turn over)**

- 6 (a) An aluminium atom has the atomic number 13 and the mass number 27.

Which row shows the numbers of subatomic particles present in an aluminium ion,  $\text{Al}^{3+}$ ? (1 mark)

	protons	neutrons	electrons
<input type="checkbox"/> A	13	14	13
<input type="checkbox"/> B	13	14	10
<input type="checkbox"/> C	14	13	10
<input type="checkbox"/> D	14	13	17

(Question continues on next page)

(Turn over)

- (b) Magnesium burns in excess oxygen to form magnesium oxide.  
The balanced equation for this reaction is



Starting with 1.35 g of magnesium, calculate the maximum mass of magnesium oxide that could be formed in this reaction.  
(relative atomic masses: O = 16.0, Mg = 24.0)

You must show your working.  
(3 marks)

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(Continue your answer on next page)

(Turn over)



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mass of magnesium oxide = \_\_\_\_\_ g

**(c) Chlorine reacts with hydrogen to form hydrogen chloride.**

**Write the balanced equation for this reaction. (3 marks)**

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**(Question continues on next page)**

**(Turn over)**

**\* (d) Sodium chloride is an ionic compound, containing sodium ions,  $\text{Na}^+$ , and chloride ions,  $\text{Cl}^-$ .**

**Figure 10 shows the electronic configuration of sodium and chlorine.**

	electron configuration
sodium	2.8.1
chlorine	2.8.7

**Figure 10**

**Explain how sodium and chlorine atoms form the ions in sodium chloride and how the ions are arranged in the solid sodium chloride.**

**(Question continues on next page)**

**(Turn over)**

**You may wish to use diagrams in  
your answer. (6 marks)**

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**(Turn over)**

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**(Turn over)**

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**(Continue your answer on next page)**

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**(TOTAL FOR QUESTION 6 = 13 MARKS)**

**TOTAL FOR PAPER = 60 MARKS**

**END**