

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.
- 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.

**(Continued on next page)**

**(Turn over)**

**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.**

**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**

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

**(i) Figure 1 on page 5 shows an incomplete bar chart of the main gases in the atmosphere.**

**(Question continues on next page)**

**(Turn over)**

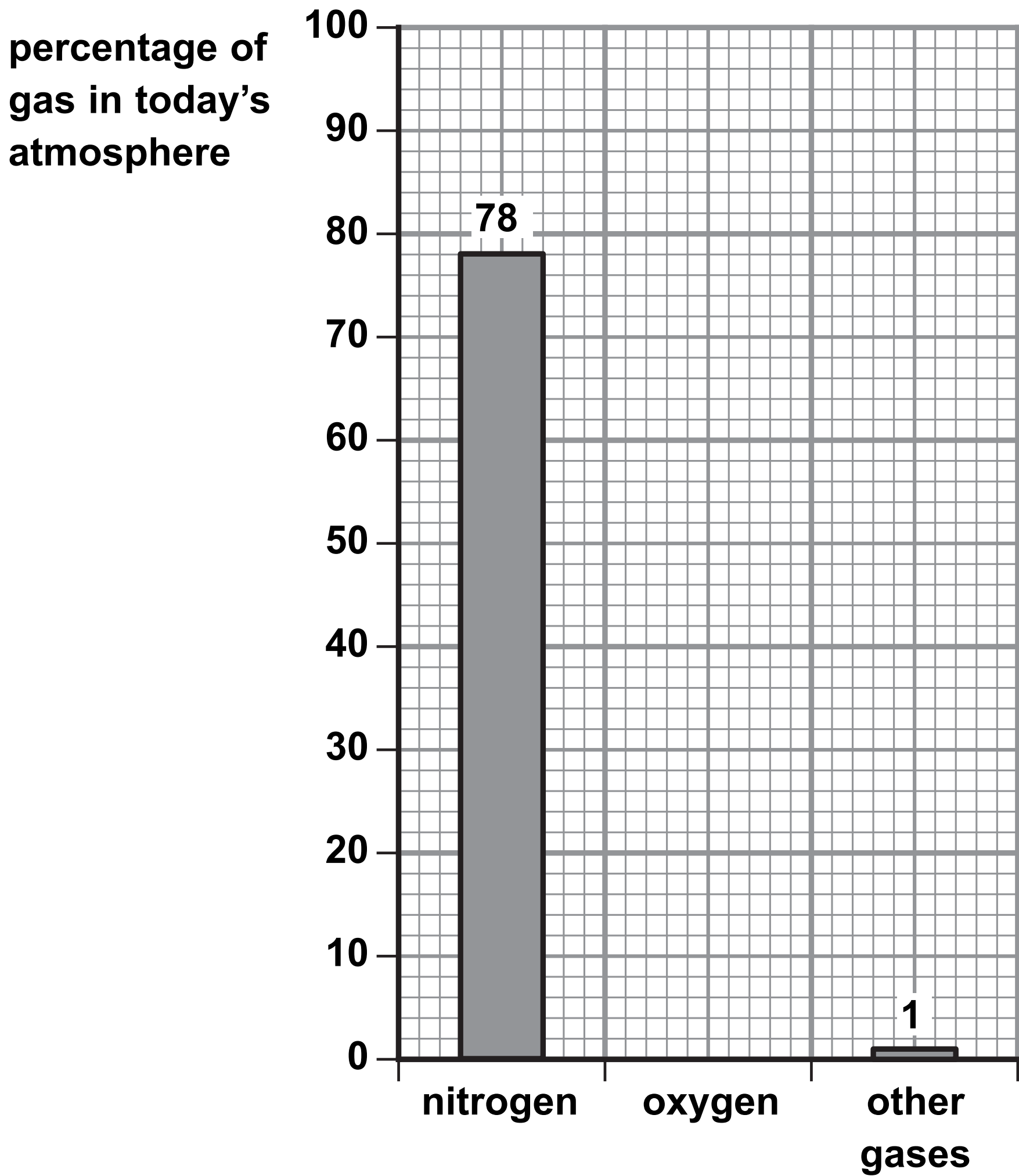


Figure 1

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

(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)

- (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)**

**(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.

element	melting point in °C	boiling point in °C
bromine	−7	59
iodine	114	184

Figure 2

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

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

(Question continues on next page)

(Turn over)

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

name	density in $\text{g cm}^{-3}$
helium	0.15
neon	1.2
argon	1.4
krypton	
xenon	3.5

Figure 3

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

density of krypton = \_\_\_\_\_  $\text{g cm}^{-3}$

(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.

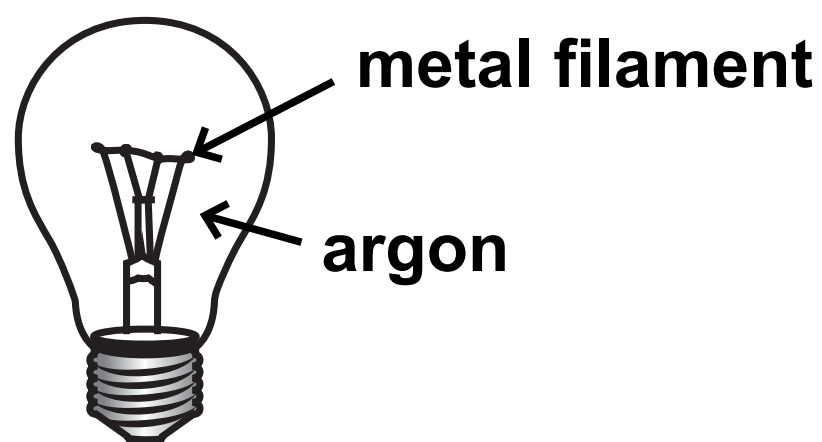


Figure 4

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)

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

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**(Questions continue on next page)**

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

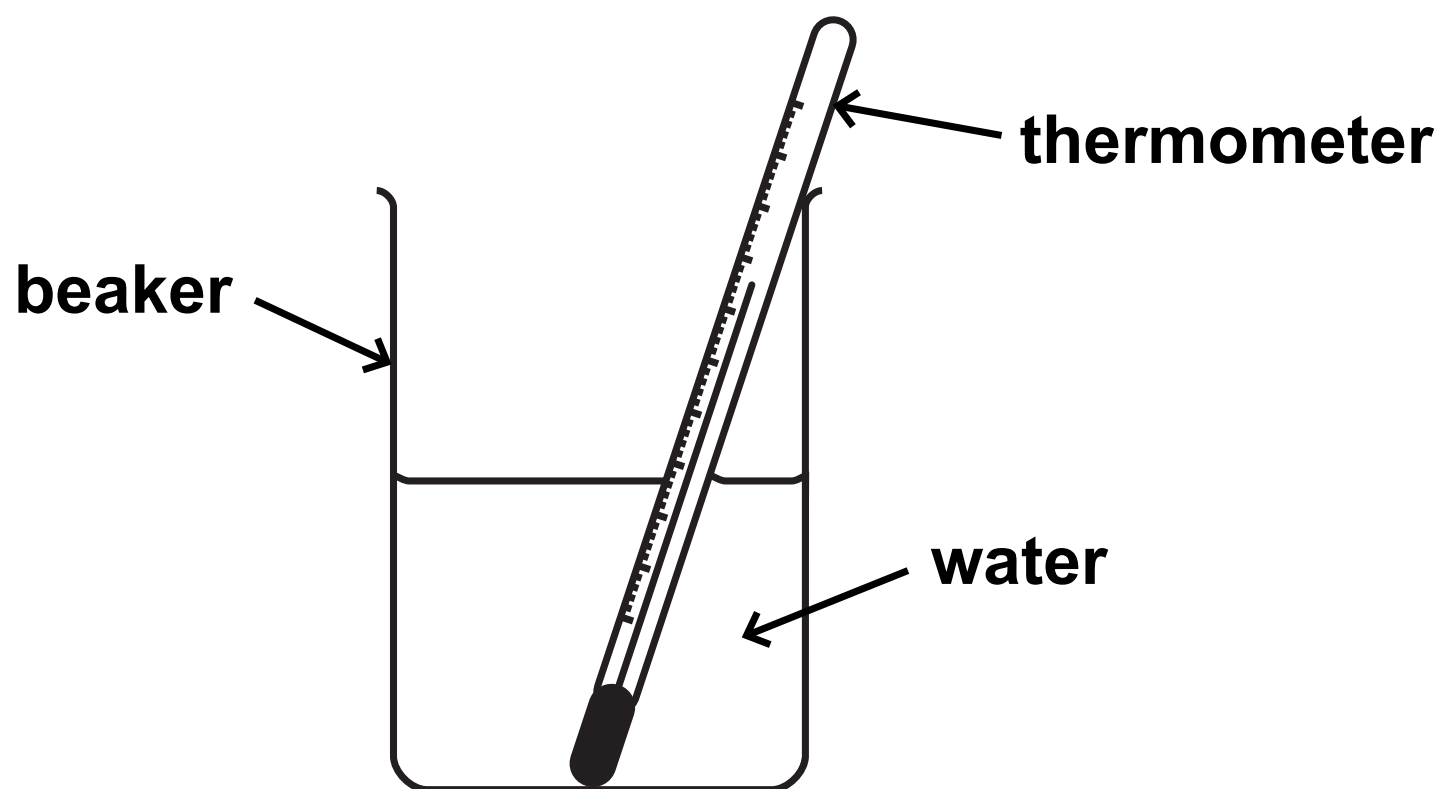


Figure 5

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)

**(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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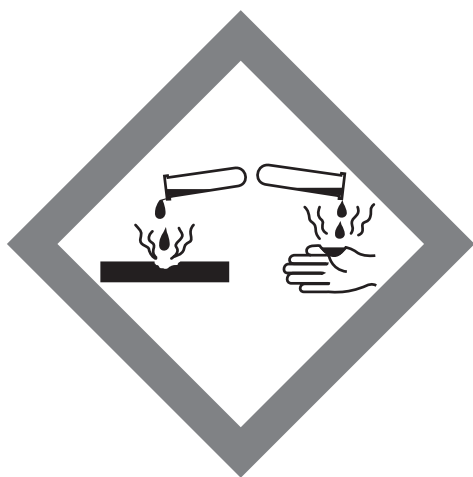
**(Turn over)**

(c) Calcium chloride is hazardous to health.

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

☐

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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**(Question continues on next page)**

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

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.

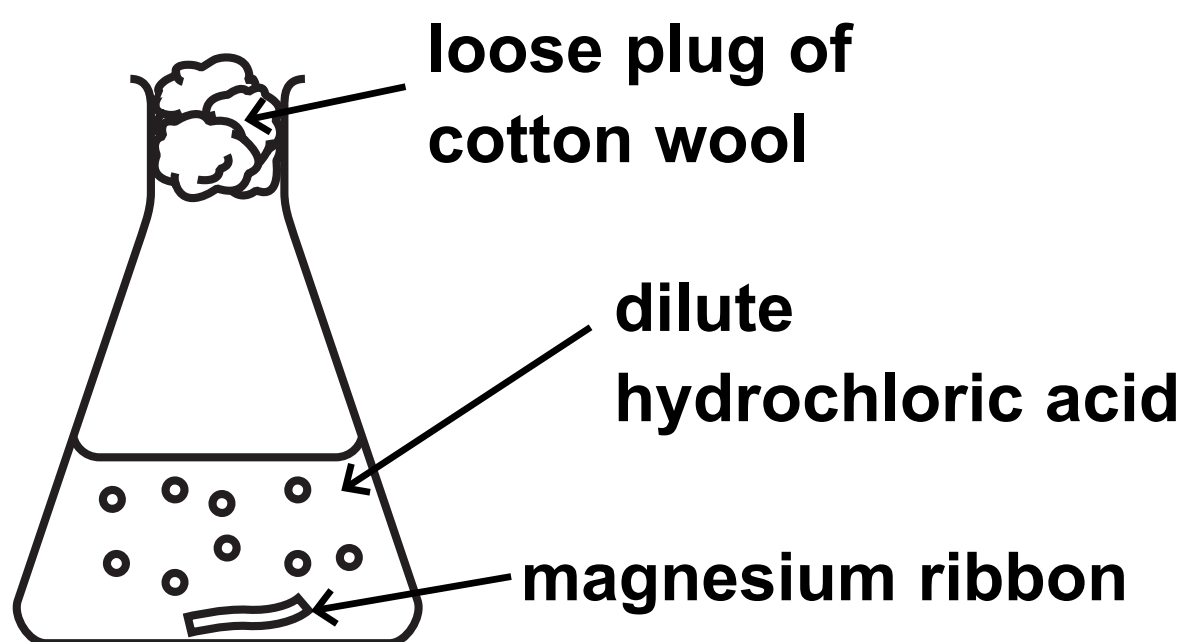


Figure 6

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 20 shows a graph of the results.

(Question continues on next page)

(Turn over)

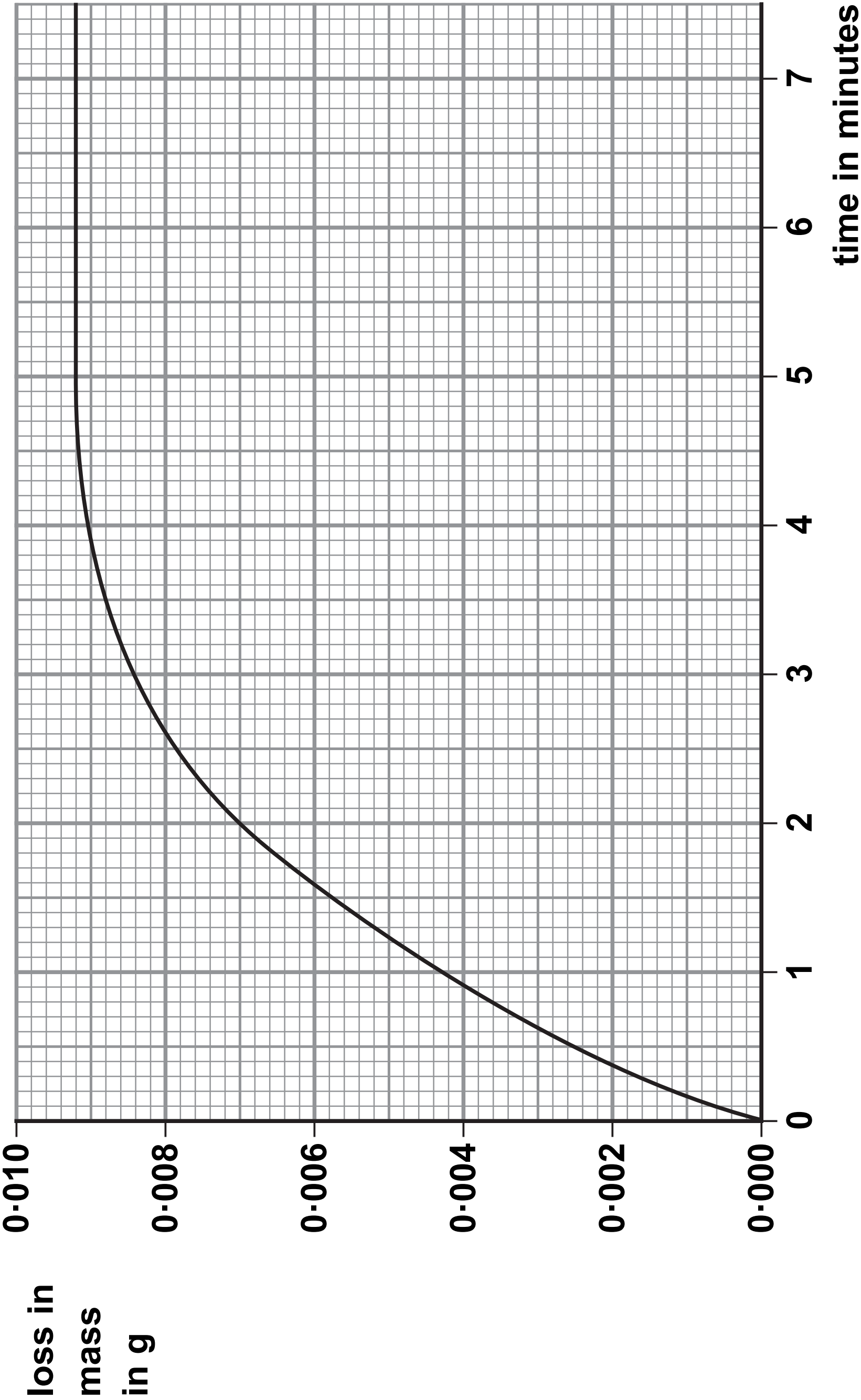


Figure 7

(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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(Question continues on next page)

(Turn over)

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

**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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- (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 20, 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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**(Question continues on next page)**



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

**(Questions continue on next page)**

**(Turn over)**

**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**

**(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)**

**(Turn over)**

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

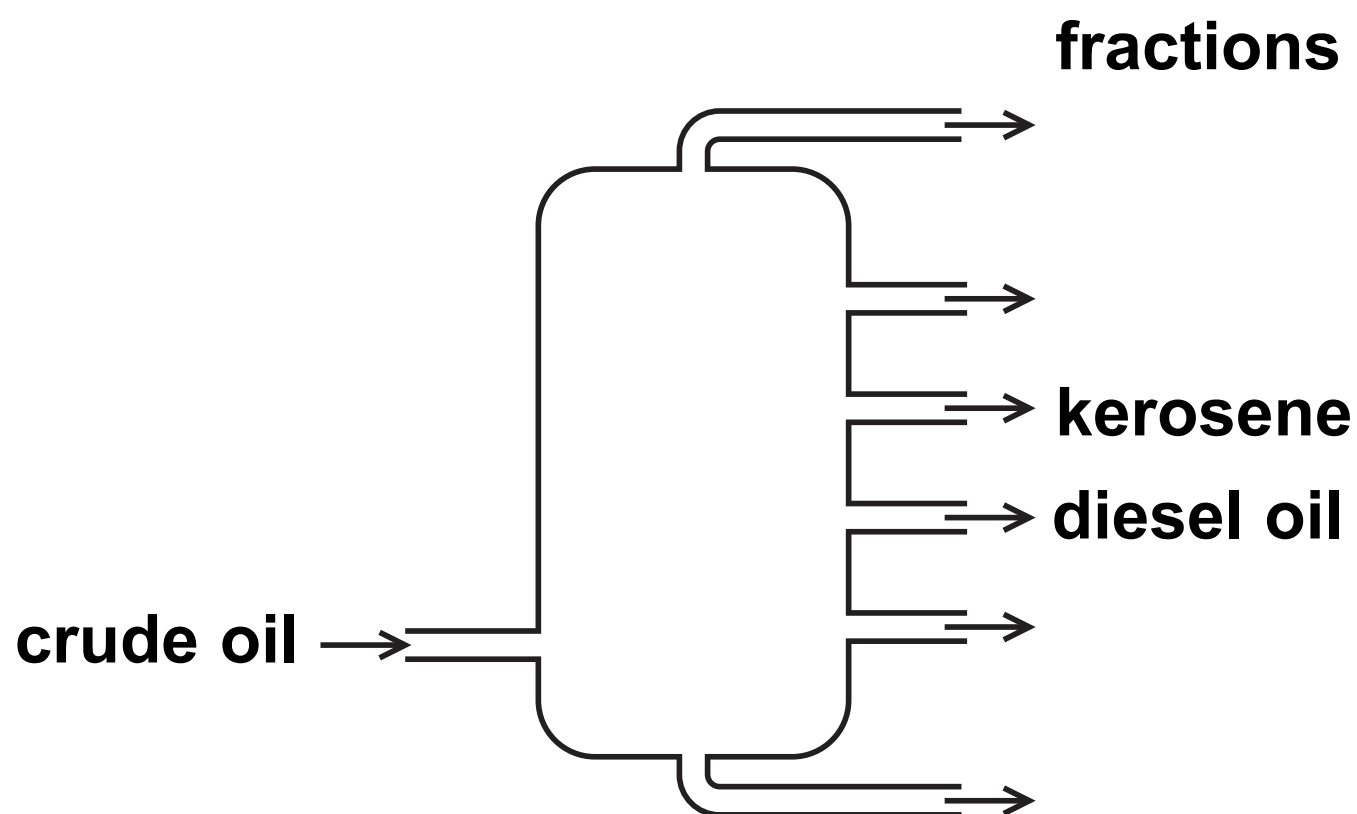


Figure 8

Kerosene is obtained higher up the column than diesel oil.

Kerosene and diesel oil fractions have slightly different properties.

Choose a property.

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

property \_\_\_\_\_

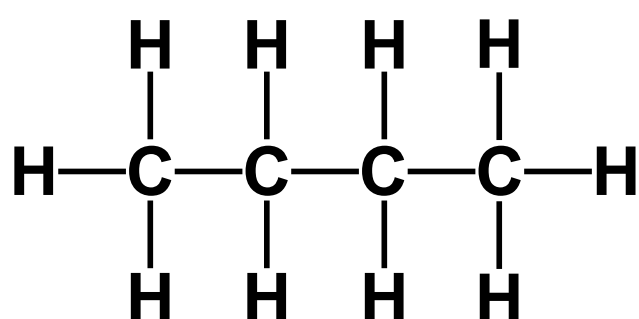
comparison \_\_\_\_\_

(Question continues on next page)

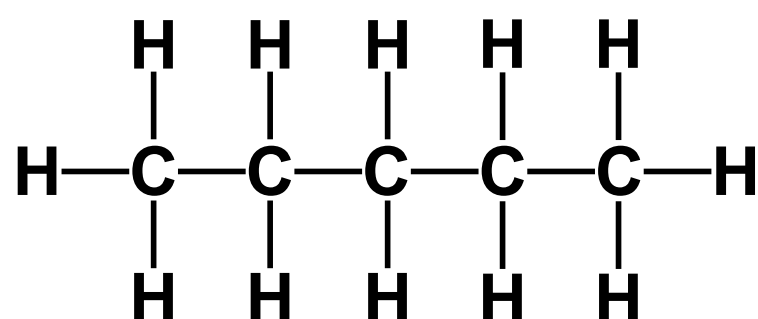
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(c) Figure 9 shows the formulae of a molecule of butane and of a molecule of pentane.

Butane and pentane are neighbouring members of the same homologous series.



butane



pentane

Figure 9

- (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)**

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**(Questions continue on next page)**

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

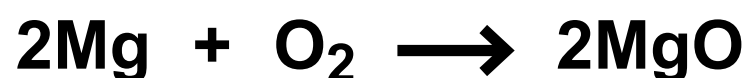
Which row shows the numbers of subatomic particles present in an aluminium ion,  $\text{Al}^{3+}$ ? (1 mark)

	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)

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

(Question continues on next page)

(Turn over)



- (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)

- \*(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.**

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

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

**(Turn over)**

[illegible][illegible]

[illegible][illegible]

[illegible][illegible]

\_\_\_\_\_